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Specific objectives were: the effects on art and creative personality of self-discovered as externally supplied criteria for evaluating one's own art work; process feedback, where evaluation is made by still photos taken at regular intervals as the work emerges; product feedback, where end product values are stressed; interactive and independent settings of evaluations; and spontaneous students as opposed to divergent students. Art activity was described as an intrapersonal dialogue between artist and the evolving art object and was designated as a private, covert affair. A "value neutral field" created the proper climate for a learning study in art through removal of threat and extraneous motivational incentives.

Time and continued production of art appeared to increase the relationship between creative personality, and self-descriptive measures and art criteria. In one experiment spontaneous and divergent still life stimuli were used. Three criteria were judged; aesthetic quality, spontaneity, and divergency. Four experiments were given: art-dependent variables, dependent variables representing the capacity for creative action, variances of period to period dynamics on the art dependent variables, and one teaching experiment. It was found that period to period analysis bring increased sensitivity over cumulative analysi In the case of aesthetic quality and spontaneity there were no significant cumulative main effects on simple interactions, but these did appear in period to period analysis. The middle period showed peak effect especially in the case of aesthetic quality.

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COOPERATIVE RESEARCH PROJECT NO. 1874

KENNETH R. BEITTEL

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THE PENNSYLVANIA STATE UNIVERSITY

Effect of Self-Reflective Training in Art on the Capacity for Creative Action

Cooperative Research Project No. 1874

Kenneth R. Beittel

The Pennsylvania State University
University Park, Pennsylvania

1964

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CHAPTER I

INTRODUCTION

I. Background of the Study

There is too little known to have firm theories about learning and creativity in art. The intellectual climate is right, however, to enter into conjecture on these topics and to risk an oblique attack upon them through experiments.

It would be untrue to suggest that the studies to be reported herein grew out of a clear theoretical position. There was an implicit position and there were unstated assumptions suggested by the title of this research, but the articulation and delineation of these dimly perceived and global concepts only occurred as operations, treatments, and variables were spelled out. Expansion of art criteria occurred through analytical procedures and analyses and through the emergence of dynamic or process data brought to the foreground by the requirements of one of the main independent variables. These latter data led to the isolation and description of two equally creative but antithetical art strategies consistently employed by students and to revisions in earlier positions concerning spontanetiy and creativity.

As implied in the title of this study, it was believed that "self-reflection," as earlier defined through process recall (how one worked in art, how one felt while working), and through evaluative activity on the part of the student, surrounded by his own works (another kind of "self-reflection" which is practiced by most artists in their own studios), would implement progress or learning in art and also affect favorably one's creative attitude and self-concept as commonly measured within the general creativity domain.

The position that personal knowledge and insight are acquired through the practice of art, especially drawing and painting, is not a new one. Lowenfeld (44) spoke of "self-confrontation" and Read (59) of the belief that art yields a kind of knowledge different from that obtained by discursive and semantic symbol systems. There are, in addition, many statements concerning the positive therapeutic effects of art experiences, almost always presented without empirical evidence and dependent upon the skill of some outstanding teacher or therapist.

What knowledge exists on self-reflection, evaluation of one's own art, and the connections between creativity and art will be detailed later. The purpose of discussing them here is to indicate that they are part of the "belief system" of many art educators and form the ground for this work.

The most direct parallel to the assumptions underlying this study may be found in the "Tentative Theory of Creativity" earlier outlined by Rogers (62). Conditions approximating what he called "psychological safety" and the "internal locus of evaluation" were built into the structure of the experiments and tested by appropriate alternatives. The general focus on "process" encouraged by art educators and writers on creativity was also represented in the treatment variables and tested by its opposite.

Finally, the growing interest of psychologists, anthropologists, and philosophers in systems, neo-gestalt concepts, and existential realities seen as applicable to living organisms and to cultures, led to the conceptualization of the self-reformulative or self-correcting aspect of the design, where a system is seen as "regulated" by the input or feedback of its own output. To be sure, the cognitive elaboration of these concepts came, again, after the finding that "depth" or continuity in topic and medium were helpful for art students (Mattil, et al., 48).

II. General Objective of the Major Experiment

The superordinate objective of the study was nothing short of the desire to simulate a favorable learning environment for art activity where, during the evaluative phase of the experiment, the variables concerned with internalization, process emphasis, nondirective interaction, and self-correction could be systematically varied and their effects on art works and creative personality measures observed. Stated in different words, the treatment phase of the major experiment attempted to study the effect of variation of the content, form, and source of feedback (self-reflection) on art and creative personality variables, and to see whether there might be interactions of these with the student's art strategy.

III. Specific Objectives

In terms of the independent variables of the major experiment of this study, the question asked was:

What is the effect on art and creative personality of:

1. A-1 Self-discovered criteria for evaluating one's art works, as opposed to

   A-2 Externally supplied criteria, presenting the "best" known criteria, representing non-overlapping domains of judgment.

2. B-1 Process feedback, in which one evaluates still photos taken at regular intervals as his work emerges, as opposed to

   B-2 Product feedback, where end-product values and emphases are stressed.

3. C-1 Interactive setting, where an interested, non-directive, moderator encourages the student to talk about his work, as opposed to

   C-2 Independent setting, where the student follows a "program" procedure and writes out his evaluations.

4. D-1 As seen on Spontaneous students (to be defined, and as classified on their first week's art products, which are uninfluenced), as opposed to

   D-2 Divergent students.

IV. Subsidiary Objectives

1. It was felt to be important to attempt further "domain mapping" of the art criterion area, as judged from end products.

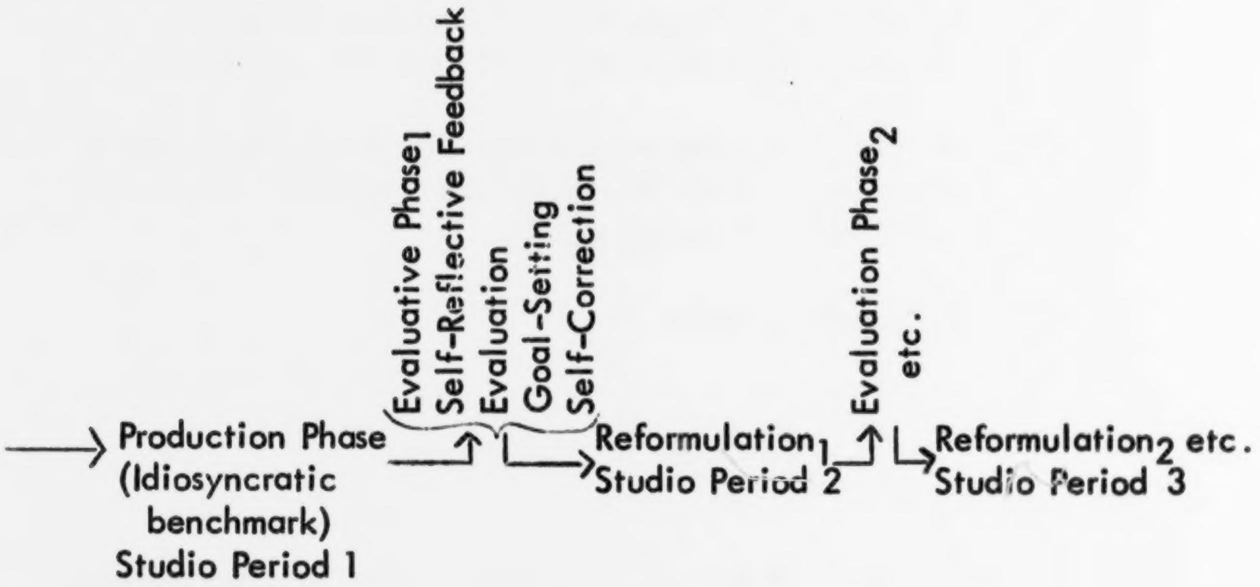
2. The method of experimentation utilized in the major experiment permitted a closer look than in former art experiments at the dynamics or curves of change, as tracked from one studio period to another on the dependent art variables, judged on the photographically recorded process and end product data. Although this study did not set out to define differing art strategies, it did intend to look more closely at process changes over time and under treatment. The kinds of data collected led directly to the definition of strategies and to the beginning of work on a new kind of criterion measure, referred to later as Strategy Complexity, as obtained from what is called herein Internal or Intra-Individual Judgments, where an individual is compared on a number of criteria (constituting a strategy cluster) against his own beginning benchmark or base (before experimental influence).

3. In addition to the major experiment aimed at conditions ameliorating learning in art, a pilot study and then an experiment was carried out connecting the learning study (major experiment) to personalities and strategies of teachers and to further analysis of the process feedback variable (by varying the timing of its occurrence).

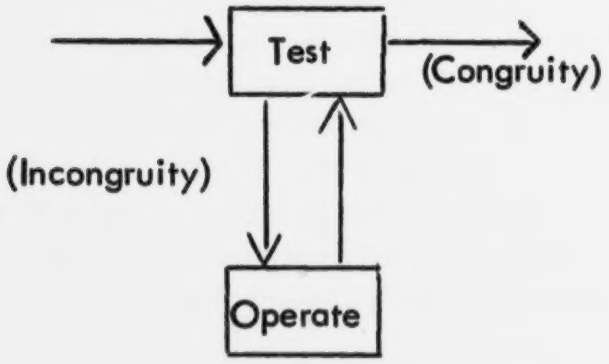
V. General Theoretical Considerations

Learning Models

Self-reflective learning is thought to have a reformulative base equivalent to that conveyed by the concept of a "regulated system" (see Maccia et al., 46), which can be represented by various models, one of which is shown here:


Production Phase
(Idiosyncratic benchmark)
Studio Period 1
Evaluative Phase1
Self-Reflective Feedback
Evaluation
Goal-Setting
Self-Correction
Reformulation1
Studio Period 2
Evaluation Phase2
etc.
Reformulation2 etc.
Studio Period 3

In psychological literature, the closest building block of use in this context comes from the work of Miller, Galenter, and Pribram (53), who developed a theory of behavior on the base of the "cybernetic hypothesis" (see Wiener, 74). Their generalized schematic unit is called the "TOTE" unit (for Test-Operate-Test-Exit) and is represented thus:


Test
(Congruity)
(Incongruity)
Operate

The TOTE Unit
from Miller, Galenter, and Pribram:
Plans and the Structure of Behavior (53, p. 26)

The authors mentioned above set out to explore the relation between the "Image" and the "Plan", the former representing the knowledge and "map" the organism has of the world and itself, the latter representing the hierarchical process by which an organism controls the order in which a sequence of operations is to be done (ibid., pp. 16-17). Further, unlike groups (and computers), which are 90% plan and 10% image, individuals are felt to be 75% image and 25% plan (ibid., p. 100). Continued reference has been made to this book because it comes closest to paralleling and elucidating the unexplicated assumptions underlying the theory of this study. As the authors say: "Different evaluations do indeed modify a person's Image of his problem and so lead to different forms of behavior." (ibid., p. 51.)

Another fruitful comparison occurs between the general model of learning for this study and the concepts of D. M. MacKay (47), who attempts to reconcile the idea of feedback and the hierarchichal organization sensed in human behavior. MacKay identifies, as in the "cybernetic hypothesis," an operational phase and a feedback phase to each cycle of behavior, much as in the model underlying this study. MacKay makes the consequences of one operational phase the input to the comparator of the next cycle, and suggests that there will be a movement into progressively higher degrees of abstraction away from external reality. Examples of sequential art works produced by an individual over the four studio periods within the major experiment of this study suggest support for this concept.

Assumptions Concerning Art Activity as Represented in Learning Experiments

Unlike learning activity in most subjects, art activity depends but little on group interaction (or human interaction at all in the direct sense) or on verbalization. The artist, sophisticated or naive, is seen as essentially enclosed in a dialogue between the self (with attendant "images," "cognitive map," life history, etc.) and the object (through medium and tools, through the unpredictable and irreversible results of processes, through "plans" for operations, etc.). Following Polanyi (57), and, indeed, Buber (20), it is logically proper to call this relationship occurring between artist and object during the creative process a "dialogue," and ascribe to the artist, according to Arendt's definition of "work" (1), a desire to master (with creative openness) means-to-end control. Following this formulation, the researcher finds it essential to erect standard but minimally interfering check points to aid him in observing such a fluid and covert process. Inside this dialogue are locked "meaning," arising from "context," and "message," arising from "contrived order". As Polanyi defines it (op. cit., p. 58):

> We may describe the kind of meaning which a context possesses in itself as existential, to distinguish it especially from denotative or, more generally, representative meaning. ...All kinds of order, whether contrived or natural, have existential meaning; but contrived order usually also conveys a message.

The point to make here concerns the complexity and covert nature of the creative process in art and the extreme sensitivity required to penetrate the structure of this dialogue at the present state of knowledge. In this study, therefore, it has been assumed that this dialogue is a private affair, operating through the perception and history of the artist, and that it is hard to understand "from the outside."

For the above reasons, the studio phase or "art process dialogue" has been separated out from a feedback or evaluative phase. The global nature of this division is acknowledged, for certainly evaluation occurs constantly within the studio phase. In setting up a formal evaluative phase, however, the creative process retains its wholeness in operation but is made open to educational influence, and hence experimentation and research. It was further assumed that whatever took place during the formal evaluative phase would only prove effective to the extent it could enter into the studio phase, and hence operate in harmony with the artist's idiosyncratic base.

Environment for Self-Reflective Learning Experimentation

Following from the above discussion comes the idea of a "relatively invariant frame" or setting in which both studio and evaluative phases occur. In operational terms, this means that the same medium and tools, the same stimulus complex, the same photographic and evaluative procedures, etc., were maintained throughout experimentation. Where complexity and covertness are the rule, the invariant frame makes observation possible. Where self-reflection, self-correction and reformulation are desiderata, the invariant frame makes it possible for the individual to view his own movement or dynamics against a stable ground. Philosophically, admittedly, "one does not put his toe in the same river twice," and time is like this, existentially. The invariant frame is "the river," figuratively speaking.

Seen as equally important in the learning or experimental environment was what is called herein a "value neutral field." By this is meant something akin to Roger's "psychological safety," which he advances as a condition for creative performance (62). In specific terms, it meant that the experiment was not attached to course work and that no grades were given. Subjects were not paid for participation. The effort was made to see the goal as self-knowledge and learning, and as intrinsically rewarding and motivating. In this context, the researchers were seen as researchers and not as teachers by participants, and every effort was made to accept a full range of behavior within the constraints of time, space and conditions represented by the "frame" of the environment.

VI. Definition of Terms

To facilitate the presentation of data and its discussion, certain minimal terms will be presented here as they will be used in this study.

Art Strategy

This term will refer to consistencies observable in the processes by which a student makes his art works. Strategies are seen in this study in the form of process photographs taken at regular time intervals as an art work is being executed.

Two art strategies are identified in this study. The Spontaneous Strategy, in broad terms, exhibits a beginning big organic statement devoid of detail but suggestive of a whole picture. Through progressive medium interaction, centralization, movement, incorporation of process-inspired accidents, and suggestion, students utilizing the spontaneous strategy focus on the whole problem as they feel it and try to solve it through procedural experimentation. (See Figure 3, p. 33.)

In the Divergent Strategy, the student typically begins by drawing with considered fine line control a single element which is some portion shows the early inclusion of relatively precise detail. As new elements are added, an alteration of viewpoint and shifting of focus is likely to occur, and the work is off-center and tensional. Through line, black-white contrasts and positive-negative figure-ground reversals, the work undergoes unexpected changes, and becomes flatter and often simpler. (See Figure 4, p. 35.)

Art Strategy Criteria

The molecular units of an art strategy can be seen in a cluster of signs defining the inner workings of that strategy. In this study 19 criteria define the Spontaneous Strategy, 21 criteria the Divergent Strategy. (See Table II, p. 28, and Table III, p. 29.)

Differential Art Criteria

As part of a concerted effort to analyze discrete criteria for the judgment of art products, a series of descriptive and essentially value-free criteria were isolated and their dimensionality studied over a series of art works. The resultant domains were called (1) spontaneity, (2) divergency, and (3) formal quality. These criteria are end product criteria and as such were not meant to describe strategies.

Dynamics of Learning

In this study an attempt was made to study the curves of change occurring under treatment. Thus changes on the basic dependent variables were plotted over the four studio periods in the Major Experiment. Dynamics will herein refer to the period to period comparisons showing the effect of treatment on various dependent variables.

External or Comparative Judgments

This designation is used to refer to the more typical judgment method used in judging art works. Products in this kind of judgment are randomized across individuals, studio periods, and treatment groups. Criteria of judgment are applied one at a time and in random order for the various judges.

Internal or Intra-Individual Judgments

With the discovery of strategies and the eduction of Art Strategy Criteria, a different judging process became possible. In this method much time is taken in judging the work of one individual (without knowledge of his treatment group). His later studio periods (treatment influenced) are compared against his first studio period (uninfluenced by treatment), and the latter is taken as his idiosyncratic base or benchmark. Then, one at a time, the 40 Art Strategy Criteria, which together define the two art strategies, are applied and credit given for the emergence or increased intensity of these criteria over the uninfluenced base.

Major Art Learning Experiment or Major Experiment

This term will designate the experiment in which N=96. The design of this experiment is shown in Table V, p. 43.

Major Experiment: Art Dependent Variables

Since these will be defined in the procedure chapter, they will be named only at this point.

1. External or Comparative Judgments:
    - (a) Aesthetic Quality
    - (b) Spontaneity
    - (c) Divergency
    - (d) Greatest Strategy Gain
2. Internal or Intra-Individual Judgments:
    - (a) Within Strategy Gain
    - (b) Spontaneity
    - (c) Divergency
    - (d) Combined Strategies
    - (e) Opposite Strategy

Major Experiment: Personality Dependent Variables (Measures Representing the Capacity for Creative Action)

These will also be defined in the procedure chapter and only named here.

1. Set I
    - (a) Complexity
    - (b) Aestheticism
    - (c) Theory
    - (d) Social Self-Determination

2. Set II
    - (a) Originality
    - (b) Creative Independence
    - (c) Flexibility
    - (d) Object Question

Major Experiment: Independent Variables

Detailed definitions will be given in the procedure chapter.

A-1	Self-Discovered Criteria
A-2	External Criteria
B-1	Process Feedback
B-2	Product Feedback
C-1	Interactive Setting
C-2	Independent Setting
D-1	Spontaneous Students
D-2	Divergent Students

Teaching Experiment

This term will designate the study in which N=31. The design of this experiment is shown on Table VI, p. 52.

Teaching Experiment: Art Dependent Variables

External or Comparative Judgments only were used:

1. Aesthetic Quality
2. Spontaneity
3. Divergency
4. Greatest Strategy Gains

Teaching Experiment: Independent Variables

As named only:

A-1	Delayed Process Feedback
A-2	Immediate Process Feedback

B-1 Interaction with Spontaneous Teachers
B-2 Interaction with Divergent Teachers
B-3 Independent Setting
C-1 Spontaneous Students
C-2 Divergent Students
D-1 Sustaining Questions
D-2 Entry Questions

VII. Summary

As previously stated, the major experiment in this research attempted to simulate a favorable learning environment for art activity where, during the evaluative phase of the experiment, variables concerned with internalization-externalization of evaluative locus, process-product feedback emphasis, and interactive-independent setting for evaluation could be systematically varied and their effects on art works and creative personality measures and types observed. The general learning model of this experiment was presented as a series of cyclic reformulations brought about by self-reflective feedback. Art activity was described as an intrapersonal dialogue between artist and the evolving art object and was designated as a private, covert affair. The studio phase of art learning experiments was set off from a formal evaluative phase to jointly honor the dialogue and make it open to educational influence. Similarly, what was called a "relatively invariant frame" was to create for researcher and participant alike a stable ground against which to focus on change or dynamics. Finally, a "value neutral field" was to create the proper climate for a learning study in art through removal of threat and extrinsic motivational incentives.

CHAPTER II

RELATED RESEARCH

I. Introduction

Studies which have led to the present research or which are closely related to some central aspect of it will be reviewed here. In the first section, those few studies which seem directly related to the general theoretical position of this report will be considered. Then research out of which came the dependent variables used herein will be considered under two main categories: (1) general creativity and creative personality, and (2) the art criterion problem. Finally, brief attention will be given the role of the teacher in the art learning process, as a background for a teaching experiment also reported in this study.

In reality, as C. W. Harris (36) has observed, criteria, predictors, and conditions affecting creativity and learning are all in the same system, so that new knowledge in one area affects, and is affected by, knowledge in another. In a rapidly developing and young interdisciplinary field such as art education, the "state of the art" of research is fluid. Within the time span of the present research, for example, several revisions to earlier knowledge of the art criterion took place.

II. Studies Related to Theoretical Concerns of This Research

In looking at learning in art as it is discussed in the literature, one finds both the question of what constitutes learning and how it comes about highly colored by the belief system and idiosyncratic instructional methodology of the person reporting. This is especially so the more influential the author is in art education. Thus Lowenfeld (44), Schaeffer-Simmern (63), and earlier Cizek (72), as examples, left the heavy impress of their own personalities on the theories of learning attributable to them. D. B. Harris (37) has attempted to abstract general principles he found in analyzing conditions under which such leaders and their groups seemed to succeed. The resultant is virtually like the definition of an ideal community. The point to be made here is that the attempt at any relatively impersonal account of how learning in art takes place is very new and fraught with philosophical and psychological dilemmas, since the honored subjectivity and freedom of the artist has been equally matched by that of the art teacher.

Logan (43), in his historical survey of art in American schools, reflects the importance commonly attributed to the progressive era in education as the period in which schools turned from harsh, disciplined, unimaginative didactics in art to freedom, exploration, and self-expression. Thus art education progressed to the place where it began to focus on creative expression as a central objective but failed to become very explicit about how such a goal might be brought about. Barkan (2) has ably shown how in just a few decades conditions have changed sufficiently so that earlier practices no longer lead to the goals they were intended to promote. Thus, for example, the desire to liberate art media from narrow bounds and usages as practiced in schools has led to the unending search for novel media and problems that change incessantly.

Against this general and very sketchy background, the studies which follow may gain added relevance to the present inquiry. Burkhart (21) reported that, under relatively unstructured conditions over a year's span, high school students seemed to prefer or to be seeking for a personal theme or focus which they could follow from work to work. He also discovered that productivity was related to level of achievement and that those students who achieved works of highest quality described themselves, in recall of how they felt while working, in terms suggesting highly elaborate, flexible, and personal evaluation systems.

Mattil (48) conceptualized and carried out a research study testing the desirability of "depth" as opposed to "breadth" in the art curriculum of a junior high school. "Depth" was defined as continuity in medium and theme over an extended period of time, whereas "breadth" designated a rich, but constantly changing, survey of media, topics, etc. Depth instruction proved to be superior, in the analysis of this experiment, on both art and general creativity dependent variables.

Further study of the depth-breadth issue at the college level, by Burkhart (24), in connection with student-centered vs. teacher-centered evaluation of art works, seemed to point unequivocally to the desirability of continued concentration in an art medium and of student-centered evaluation of student art.

Still earlier, studies such as Michael's (52) had reported on the superior performance of control art classes over experimental art classes in experimentation at the high school level. More recently, Schwartz (64) reported that what he called "structured" information and instruction from the art teacher was inferior to an "unstructured" approach which left interpretation to the student. In this same study, Schwartz utilized a descriptive check list on which students evaluated their feelings about their on-going art works at the mid-point of the experiment. He found that students who had done this formal evaluation produced works superior in quality and spontaneity. Though there may have been a Hawthorne effect in this instance, the results were in line with implications compounding from earlier findings.

In general, the suggestion that depth was important led to the conceptualization of certain aspects of the invariant frame represented in the theory and operations of the present experiment. Media, tools, and stimulus for drawing or painting were held constant over time.

Student-centered evaluation of art works was elaborated upon and fused with the "unstructured" vs. "structured" aspect of prior studies, or with the issue of greater or less "imposed conditions" in terms of criteria for evaluation, as defined generally in Eisner's paradigm (29). Previously, this issue has been related to Rogers' (62) internal vs. external locus of evaluation.

In terms of teacher-pupil interaction, the model suggested by the client-centered theory of psychotherapy (Rogers, 60), theories of learning and psychotherapy (Dollard and Miller, 28), were added as operational definers of teacher role in terms of the image arising from findings endorsing that which is less structured externally and that which encourages one to evaluate his own art. To be sure, Lowenfeld (44), Read (59), Buber (19), and others have seen the teacher as a releaser of ideas, values and feelings in the child or student, and thus urged the teacher to encourage the student to talk and evaluate while the teacher listens to him with empathy and interest. Clements (27), however, has found that teachers in the public school do not do these things, in practice, as seen from analyses of their question-answer habits.

It will readily be seen that in terms of how a teacher or teacher moderator should really act or be represented in a learning experiment in art, some difficulty of conceptualization was encountered. Thus the presence or absence of such a non-directive teacher surrogate was made the focus of study in the experiments herein, with hope that further definition of teacher role in art learning might result. In the teaching experiment which followed the major experiment, greater precision of definition was attempted.

III. Art and General Creativity and Creative Personality

Early Studies

As pointed out by the author recently (Beittel, 9), any discussion on the relationship between art and general creativity is likely to reflect a biased history and end up as a projection, at best, of a partial conquest. Yet, art education as a field has reflected interest in this topic for some time. Difficulty in reporting this history is compounded by the infant state of empirical research in both the field of creativity, where widespread interest was triggered relatively recently (see Guilford, 1950, 35), and in art education, where the debate on whether empirical research as practiced in the social sciences is even possible in relation to art is still argued. A recent opinion on this latter issue may be found in Hausman's chapter in The Handbook of Research on Teaching (30), where the inadequacy of the methodologies of the social sciences for the study of art is cogently enough expressed to convince one reviewer that research on the teaching of art "...cannot be done through use of customary research tools and symbols" (see Spalding, 66). Under these conditions it is little wonder that early inquiries into art and creativity have been as polemic as scientific.

A series of studies by Lowenfeld, Beittel, and Britain (see references 45, 14, and 15) attempted, with meager success, to relate paper-and-pencil creativity tests, largely from the studies of Guilford and his associates (33 ,34), to various art performance criteria as judged from art works produced under relatively controlled conditions. The author has commented in some detail on these studies in other reviews (see Beittel 4, 5, 8, and 9).

In brief, paper-and-pencil tests of general creativity, measuring "ideational fluency," "spontaneous flexibility," "originality," etc., did not relate to art performances significantly. To be sure, this lack of relationship may have been attributable to the test, the art performances, or the way the latter were judged. In any event, holding to the art product itself as the criterion of major significance, researchers in art education turned toward personality tests and toward other ways of looking at the art object.

Art, Spontaneity, and Creative Personality

Aesthetic quality as a criterion for the judgment of art work has consistently evaded efforts to define it. As earlier affirmed:

> There is an element of risk needed in doing a research. ...what is meant is that to do research in art education one must become to some degree appreciator, critic, and judge (and perhaps at least potentially creator) and take on oneself the risk...of facing the criterion problem by identifying quality through human judgment. This risk is not one of being wrong, for this is not strictly demonstrable, but of being relative. One's judgment is relative to time, environment, art object, temperament, technique, and conditions of judging, etc. (8)

In practice, we find that judges can, in fact, agree highly and significantly on judgments of aesthetic quality. Apparently, however, the properties which they respond to are contextual, or locked in the gestalt, so that the same properties may be associated with high quality in one instance and low in another. Efforts such as Lansing's (4) to break down aesthetic judgments have shown that multiple criteria for judgment have been verbally but not functionally or statistically independent of each other. The reason for this discussion is to indicate that the compexity of the aesthetic domain may have prevented it from relating to tests of general creativity.

Burkhart (22, 25) demonstrated the coherence of the spontaneity domain, as assessed from art products, with action, gesture, and free usage of medium as the main determiners; and showed that spontaneity and aesthetic quality were not highly intercorrelated. It appeared, however, that spontaneity and creative personality measures were significantly related. Examples of correlates are: complexity of personality, aesthetic and theoretical interests, social self-determination (lack of submission to authority), flexibility, confidence, independence, and self-esteem. These correlates appeared in both undergraduate and graduate art and non-art major samples (see Burkhart, 25, and Beittel, 10).

An encouraging aspect of these latter findings was the fact that they closely paralleled the reports of other researchers using different tests and different populations. MacKinnon (49), for example, in his study of more and less creative professional architects, and Westcott (73), in his study of intuitive thinking in college students, both describe their top criterion groups in terms closely matching those given above.

Burkhart and the author engaged in a prediction study with a sample of 50 graduate art and art education students, in which 12 measures successfully predicted spontaneity as judged from "demand" and "independently produced" art works (see reference, 10). Multiple correlations for spontaneity judgments averaged .84. In brief, valuable predictors included high self-rating as a creative artist in comparison with one's peers, ideational and social self-determination, abstract thinking, divergent thinking power, spontaneity or flexibility in habit and personality, and nonauthoritarianism.

The last study was the base for the dependent variables representing the capacity for creative action used in the present report. Revision and improvement of these measures was part of the first phase of this research.

It has not been at all clear, however, whether such creative personality variables should be considered to constitute the personality predisposition for creative and spontaneous art work or whether they undergo change as one's art improves in quality and freedom or as affective change brought about by favorable learning conditions or treatment. It will be noticed that aesthetic quality has crept back into the discussion because in the graduate study previously mentioned (10), multiple correlations of the same predictors with aesthetic quality were high and significant (average R was .78).

The issue of whether art leads personality or vice versa has been emphasized because the relationship between art and creativity has appeared to be a function, broadly, of time and integration. In several studies (10 and 24), art criteria-personality predictor relationships have shown considerable strengthening at post test as compared with pre test. In one such study (24), 77 per cent of predictor-criterion relationships were significant at post test, 48 per cent at pre test. From such findings has arisen the generalization that art experience (apart from treatment group differences) strengthens criterion-predictor bonds.

Thus, in this study, there was a desire to further assess the effect of treatment variables on creative personality variables shown to be associated with achievement in art. If treatments simulating good learning conditions significantly affect the personality correlates of art (and also, by suggestion, of possibly other creative acts), then there would be evidence of the plastic quality of such predisposers, and theory would advance from identification of creative attributes to their etiology. Such a statement of dynamics was felt to be needed, since being able to predict who in a population is likely to produce work of high quality and spontaneity will not tell one how to help people gain these characteristics.

IV. The Art Criterion Problem

Problems of Value and Assignation in Judgments of Art

Higher intercorrelations of judges assessing spontaneity as opposed to those assessing aesthetic quality suggest that the former are more descriptive than the latter. While attempts to "break the aesthetic atom" for research purposes have largely failed to date, the goal of searching for isolable, descriptive, detailed differential criteria which can be judged "without heat" has remained. (One such attempt, with encouraging success but lingering difficulties will be reported later in this study.)

The discovery in a judging study by the author (7) that personality characteristics of judges could account for significant variance in judgments of art made with bipolar scales from the semantic differential of Osgood and his associates (56), led to a systematic check in the comparative judgments of this report, where predicted sources of judge variability were built into the judge team as a control. In the author's judging study (op. cit., 7), three large factors of criteria emerged; and these were called (1) evaluative, (2) action, and (3) masculinity-femininity. It was the second factor, action, which showed significant differences in sensitivity as judged by judges of greater or lesser spontaneity of personality, suggesting that the judges' art strategy might well be a consistent source of bias in judgment.

The art judge may be thrown back upon his own preferences and values because of the many factors not controlled in the set of objects he is to judge, so that he has no reference points to help him be anything but subjective. It is also likely, despite the success of spontaneity judgments, that end product assessments may limit the range of judgments and the precision of judgments which would be possible if in-process samples or records were available to the judge.

Nitschke (55) developed an instrument variously called the Multiple Purpose Drawing Exercise and the Drawing Behavior Sample Test. In this exercise or test, the subject is asked to follow these instructions:

> Starting with the lines and shapes in the first rectangle, develop in the rectangles to the right four compositions. Complete one horizontal row at a time.

These are not to be "finished drawings," but "thumbnail sketches" to explore the ideas and suggestions as they develop while working.

By having a stimulus drawing to refer to as the base, the researcher could make a number of judgments not ordinarily possible from a varied set of end products. In getting four variations from this stimulus, the judge could look for characteristics having a process sound--for example, progressive abstraction, introduction of new objects, rearrangement, relocation of the picture plane. By getting a number of samples quickly, in a more relaxed way where much energy did not go into the achievement of a "good picture," the judge felt he had a wider sample of the subject's drawing and thinking behavior. The stimulus drawing that proved most useful in the variety and stability of sketches it elicited was a simple, almost neutral and stereotyped black and white still-life, in which a bottle, cup, jug, and flower pot were shown on a table with a cloth draped over one side of it. (For examples of drawings and stimulus, see Figure 1, p. 27, and Figure 2, p. 31.)

As will be discussed later, this instrument made it possible to swing loose in more detail the criteria accounting for spontaneity, and, in addition, led to the isolation of a divergent domain and a formal domain of criteria. Along with an assessment of a subject's "evaluative power" (operationally defined as the number of differing criteria a subject could apply to a series of art objects, in relation to the actual difference in ordering the objects which these criteria were seen to cause), a subject's "art profile" might be conceived to consist of the spontaneous, divergent, and formal characteristics judged in a drawing sample. It is exciting to find how nearly these dimensions--spontaneity, divergency, evaluation, and form--match structural components of creative thinking advanced by others. Henle, for example, speaks of "freedom, novelty, correctness, and harmony," (38).

It may be because of the multiple dimensions of the creativity domain that much of the literature discussing the nature of creative thinking advances a paradoxical set of virtues--for example, Bruner's "passion and decorum" and "deferral and immediacy" (17), or Henle's "detached devotion" (38). Perhaps in some individuals the profile of their creative thinking powers would show strength on several or all dimensions, so that the "restructuring of the cognitive map" of which Hyman (40) speaks, brings into play simultaneously generally opposed or at least independent dimensions in the effort to solve a problem.

Emphasis on Process Data and Thinking Strategies

Lowenfeld (44) was fond of saying that art education placed its emphasis on the "process" and not the "product," and that this was the way to elicit creative behavior. Thus, a teacher did not give severe criticism or work at the improvement of a finished work, but rather fixed attention on how to free and motivate the student in his next attack, or from work to work.

The notion that "process realities," though difficult to describe, may be the proper focus for any account of the hierarchical, sequential, contingent and contextual nature of man's behavior is not new, since its application to the social sciences was preceded by changes within philosophy and the physical sciences.

In art education, Michael (52) found, with high school students, a clear distinction between students using "trial-and-error" and "preconceived" approaches to the working process. Burkhart (25), in developing the concept of spontaneity in art, utilized process recall and process interruption devices to get at the student's reported mental contents during process. But, although there are reports of devices to do so in the literature (see, for example, Munro, 54, and Zawacki, 75), until recently researchers have not utilized in-process art data. Schwartz (64), in a recent experiment, and earlier, Vafeas (71), had judge teams make judgments on uncompleted work.

Ludwig von Bertalanffy (3), noting that there were trends in many areas of research towards "dynamics" and generalized principles that would apply to all systems, proposed a new discipline called "General Systems Theory." Maccia (46) has defined this concept as it may relate to educational theory:

> Unlike theories which are based on assumptions of linearity and additive combination of independent units, General Systems Theory is based on assumptions of non-linearity and complex interactions among the parts which make up the system. There is centering on the behavior of the system as a whole, and leaving the system intact. Characterizations are not of units one at a time. (p. 139)

Maccia goes on to point out that, in addition to complex interactions between student and teacher, student and student, etc., "...there is interaction with oneself and with other aspects of the classroom environment other than persons." (ibid., p. 140) He believes that what is needed is "...educational theory based upon an acceptance of complexity and interaction, and so involving characterizations which leave complexity and interaction intact." (ibid., p. 140)

In a sense, thus, each individual learner may be seen as a system whose "complexity and interaction" must be left relatively intact if the researcher is to honor him as a system. This is the position outlined herein under the discussion of the theoretical assumptions of this research. That much of this interaction and complexity is covert or at least hidden from the researcher unless he develops special devices, is highlighted by the earlier work of Stern, Stein, and Bloom (67), who found the results of "stimulated recall" sessions with their subjects were equally as valid as a predictor of a learning criterion as detailed observational data, and that the two kinds of predictors were essentially uncorrelated.

Still, the focus on "systems models," "developmental models," and "change models," as these apply to "open" or organic systems, and as described by Maccia, 46, Thompson, 69, Chin, 26 , and others, though helpful conceptually do not help greatly in analysis of data at the present stage of knowledge. In many ways, both the theories and methods of analysis dimly perceived to be essential to the complexity of the kinds of data uncovered in this study are insufficiently developed, so that many procedures have had to be and will have to be constructed from the very fabric of on-going experiments.

As indicated in Chapter I, the concept of a "strategy" is seen as operationally more related to the kinds of data described herein than the systems model. In psychological literature, Bruner, Goodnow, and Austin, in A Study of Thinking, use the term strategy to refer to "regularities in decision-making" occurring in the attainment of a concept (18, p. 54). Miller, Galenter, and Pribram speak of "the hierarchical organization of behavior" and reserve the word strategy for "the molar units in the organization of behavior" and call the molecular units "tactics." (53, p. 17). In this sense, art strategy criteria become the tactics, or molecular units within an art strategy. Since an order effect is implied by the usage of the term art strategy, it partakes of characteristics of a "Plan" as defined by the same authors (ibid., p. 16):

> A plan is any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed.

The Plan is seen as being for the organism what a program is for a computer. Artists, however, like to maintain the fiction of secret means and methods, and the plans or strategies which, in fact, they utilize may not be at all conscious or verbalizable to them and still exhibit the marked regularities requisite to the designation "strategy."

Closely akin to the viewpoint in this report is the statement of position of these same authors in discussing an individual's "plans for remembering" as encountered in doing research on memorization:

> Because the particular tricks that each person will use to group and rename the materials he is attempting to remember are quite variable and idiosyncratic, they pose formidable problems for the experimentalist. In his attempts to solve them, the experimentalist might very well turn into a clinician, for every subject must be individually studied and his performance interpreted in terms of the particular Plan that he constructed. In addition, there are all of the clinician's problems of discovering what the subject's Plan really was when the subject himself is not very clear about it. But the alternative, lumping everybody together and pretending they are doing the same thing, then discovering that only a statistical theory will fit the data, is a pure example of looking for the wallet only where the light is good. The kind of memorization that we are considering here is a

> process that goes on in one nervous system at a time, and the only way to study it is to see what each individual is doing. Only after that detailed look at each individual's strategy should we begin to recite the general features that characterize everyone.
> (Miller, Galenter, and Pribram, 53 , pp. 132-133.)

Once sensing that differing strategies were appearing in the process photographs of this study, a procedure much like that described above was used to arrive at the art strategy criteria.

Without further confounding this section, the question might be raised whether there is not possibly something akin to syntactics, as developed in the study of linguistics, which occurs in the production of art. Though in visual art the contextual and the existential may be emphasized, perhaps because it is available perceptually "all at once," certainly the fact that the order is "contrived" suggests a plan, even as the record of process samples reveals a strategy. The intention of drawing or painting a thing may be a similar mental fact to the "intention of saying a thing "so well described by William James (41). And, as James suggests about speech, the "intention to draw so and so" may be the only name to give it.

V. Teacher-Pupil Interaction in Art Learning

In a way, even where a teacher is not present, or when a teacher "representative" or "moderator" is present in some specified role, a "search for the teacher" is going on in this report, as determined by effective functions which influence art learning and could, therefore, become part of the teacher's instructional methods. In discussing the general theory behind this report, mention has been made of "depth," "student-centered evaluation," "process" emphasis, and "nondirective" interaction. In one form or another, the cogency of these emphases had earlier been demonstrated by studies where teachers were present. (See Mattil, 48, Michael, 52, Burkhart, 24, and Schwartz, 64.)

It is true, however, that neither the major experiment nor the teacher experiment take place in anything like normal classroom settings; the parallel is closer to the laboratory and the artist's studio--a blend of the two.

The literature on student-teacher interaction analysis systems is growing fast. (Rather than itemize these here, the reader is referred to Chapter VI, of the Handbook of Research on Teaching (50), where Medley and Mitzel discuss "Measuring Classroom Behavior by Systematic Observation.") In connection with this report, mention is made of the work of Jones (42), which analyzed student and teacher interactions during evaluative dialogues, as these were recorded in the pilot study for the teacher experiment reported herein.

VI. Summary

There have been relatively few, if any, attempts, it was pointed out, at impersonal accounts or theories of how learning in art takes place. During and after the progressive era in education, art education accepted creative expression as a central goal, but practices which once furthered this aim lost significance as the battle against the "academy" and a rigid methodology was won. Studies emphasizing "depth" as opposed to "breadth" in the curriculum, and "student-centered" evaluation, were seen as in the mainstream of art educational thought and as leading to the theoretical concerns of this report. Nondirective counseling supplied operational definers of a teacher role meant to encourage student evaluative activity and release of affect and motivational energy in a personal and expression-laden form.

Early inquiries into the relationship of art and creativity have been as polemic as scientific. With the rise of creativity testing, there were fruitless efforts to connect art performance to paper-and-pencil tests of general creativity. The reliance on aesthetic quality judgments may have been partly responsible for this lack of relationship, since aesthetic quality is seen as a complex domain. When it was demonstrated that there is a coherent spontaneity domain, as assessed from art products, relationships between that domain and measures of creative personality appeared. These relationships paralleled descriptions of creative personality reported by other social scientists studying creativity. Eventually it was possible to isolate strong predictors of both spontaneity and aesthetic quality in art.

Time and continued production of art appeared to increase the relationship between creative personality, and self-descriptive measures and art criteria. The concept that such a battery of predictors in reality may represent a "predisposition" for creative learning was presented. Whether treatment affected the variables associated with art achievement or not was seen as needing study.

On the topic of the art criterion problem, the higher reliability of spontaneity judgments as opposed to those of aesthetic quality was discussed along with possible reasons for this difference. Judging studies have shown that the judge's personality, and, by extension, his art strategy, are a factor in art judgment. Variability brought in by the art objects themselves was seen as partially controlled by a testing device which elicited a series of quick "thumbnail sketches" from a standard stimulus. This device made possible the inclusion of process-like criteria and led to the identification of a spontaneous domain, a divergent domain, and a formal domain of art criteria.

"Process" emphasis has been encouraged by leaders in art education. Early studies in which the transition from an end-product to a process orientation occurred were discussed. General Systems Theory was seen as related to this study's concern with "dynamics" and with the individual as a system. Descriptions of the concept of "strategy" occurring in psychological literature have much in common with "art strategy" as used herein.

The teacher was seen as "represented" by means of functions connected with learning through the independent variables of experiments to be reported later. Earlier studies whose findings undergird present theory were done where teacher-pupil interaction was a factor. It was acknowledged, however, that the conditions for experimentation of this study were far removed from those of the average classroom. Mention was made of the growing number of teacher-pupil interaction analysis sytems reported in the literature, and that a beginning analysis has been attempted of student and teacher interactions during evaluative dialogues in art, as recorded in pilot work for the teacher experiment reported herein.

CHAPTER III

PROCEDURE

I. Domain Mapping of the Art Criterion Area: Differential Criteria

In an effort to arrive at descriptive criteria which maintained relatively invariant meaning and which could be clearly specified and judged with a minimum of subjectivity, Burkhart, the author, and three graduate assistants became a judge team and tried to describe in greater precision characteristics associated with the spontaneity dimension, as presented by Burkhart in his book (25), utilizing 32 color reproductions of paintings already judged to represent the spontaneity continuum. After much effort and some progress at this task, it was sensed that more than spontaneity had to be described, or, rather, that spontaneity, as used as a term, had absorbed other characteristics not properly belonging to it. In addition, the color reproductions represented art objects having too much variability in theme, medium, skill, etc., to afford a stable base for comparative judgments. A change of the objects was therefore made to the Multiple Purpose Drawing Exercise or Drawing Behavior Sample Test, as it was later called, which was developed by Nitschke (55), who was one of the graduate research assistants on this project. This test provided a common frame of reference for the eduction of differential criteria by the judge team, since in it each subject drew three thumbnail sketches (in later versions, four) in dark pencil, in left to right sequential order, from the same stimulus. Only the still-life stimulus was utilized in the sample of works considered by the judges.

It soon became apparent that additional criteria, and possibly domains competing with spontaneity, could be isolated. After much discussion and attempts at formulating criteria, a list of 15 criteria were drawn up and submitted to judgment by the 5 man team on a new sample of 24 individuals' sequences of drawings on the MPDE.

These 15 criteria were thought to fall into domains labelled (1) spontaneity, (2) formal, and (3) divergent. In addition to judging the 15 criteria, three global or gestalt judgments were made for each of these hypothesized domains and one additional global judgment for aesthetic quality.

Examination of intercorrelations and a factor analysis of the 15 criteria (see Tables 29 through 37, Appendix A, p. 131 to p. 139, for these data), showed that 3 of the 15 criteria were misnamed or weak and that several were misplaced. A revised set of criteria was therefore drawn up and further analyzed. Table 1, p. 24, shows the breakdown of the 12 criteria, called the Revised Differential Criteria, as they fall into the three domains in a factor analysis. On the same Table, note that the factor analysis of the global judgments shows aesthetic quality to be associated with the formal domain, secondarily with spontaneity, and unrelated to the divergent domain. As will be later reported, aesthetic quality judgments have continued to show low but significant correlations with spontaneity.

TABLE I

Factor Analysis
Revised Differential Criteria

	Factor 1	Factor 2	Factor 3
	SPONTANEITY	FORMAL	DIVERGENT
SPONTANEITY			
1. Detail; loose-meticulous	.856	-.232	-.168
2. Media overlap	.953	-.013	-.101
3. Border of shapes	.889	-.061	.069
4. Texture	.883	-.062	.016
5. Movement within shapes	.877	-.081	-.280
6. Objects; moving to still	.766	-.186	-.079
FORMAL			
1. Overlap-transparency	.139	-.912	-.131
2. Progressive abstraction	.346	-.836	.232
3. Connectedness	.036	-.917	.123
DIVERGENT			
1. Dominance-Sub	-.227	-.351	.789
2. Alteration of viewpoints	-.115	-.193	.889
3. Rearrangements	.009	.327	.842

Factor Analysis
Global Judgments

	Factor 1	Factor 2	Factor 3
SPONTANEITY	.949	-.018	-.059
FORMAL	.268	-.894	.202
DIVERGENT	.395	-.208	.635
AESTHETIC	.498	-.803	.034

A full report of this effort at domain mapping is given by Bernheim (12), a graduate research assistant on this project. Analyses utilizing the differential criteria, as revised, as dependent variables were carried out on the junior sample (N=48) of the major experiment, as judged on their pre and post drawing sequences on the MPDE. (For examples of these drawings see Figure 1, p. 27, and Figure 2, p. 31.)

Once process data were available on the junior sample (the first sample run on the major experiment), a shift took place from differential criteria judged on samples from the MPDE to strategy criteria judged from the process shots from the experiment itself.

II. Art Strategy Criteria

As reported elsewhere by Burkhart and the author (see reference 11), quite unexpectedly clearly discriminable differences in two art producing strategies could be seen in the photographs taken at regular time intervals while the student was at work in the studio period of the experiment. The judging work done on the differential criteria was helpful up to a point in sensing what the "tactics" or smaller units of a strategy were like; but the differential criteria were, after all, end product criteria and what are called herein, external, or comparative criteria, so that they could not get at the "grammar" of sequence and the hierarchy of emphasis locked in a strategy. What the differential criteria supplied were descriptive terms and a sense of independent domains.

It was only by a patient, clinical approach by Burkhart and the author, that criteria could be specified for the two strategies. The author realizes that the approach smacks a bit of what Brodbeck (16) calls "metaphysical holism," and the procedure of what she calls "emergentism," or the belief that there are certain undefinable group properties, eventually "explained" to some degree by the properties of parts. Yet it was the inductive build up of process samples which led to designation of the "strategy whole" from which later deductions then flowed; and these were always checked later by empirical procedures.

The process of description was to pick clear cases of the two strategies, called, as defined in Chapter I, "spontaneous" and "divergent." By comparing a student's later works with his first, it was possible to describe what was "new" or "more intense" in later works. Note that the base for comparison was always the student's own bench mark, and not any comparative judgment. Thus, such judgments have been called internal or intra-individual judgments in this study. What appeared to be clearly evident, in almost all cases, was a developmental movement, or style abstraction series, in which increased complexity (individuation) and integreation of strategy definers were evident. Integration being too difficult a concept for a beginning stage in the dynamic field of strategies, complexity alone, or increased number and intensity or clarity of parts (tactics or criteria), were settled upon as the focus.

The fact that the spontaneous and divergent strategies are nearly opposite in procedure and goal was a powerful logical tool in describing differences. Notwithstanding this fact, clearly opposite defining terms did not always occur, and no systematic effort was made to approach the task in this way. In any event, nearly equal numbers of criteria appeared in each strategy and these were then applied to the works from the major experiment. Unidimensionality of defining terms or criteria was demonstrated by Guttman Scale analyses in each domain, with Reproducibilities averaging .85.

Tables II and III, pages 28 and 29, list the 40 criteria eventually used (19 spontaneous criteria and 21 divergent criteria). Criteria are arranged in descending order of rarity, or from least to most frequent occurrence for the population of 96 in the major experiment. Criteria 3, 8, 11 and 17 from Table II will be seen as corresponding fairly closely to several criteria appearing in the spontaneity domain of the differential criteria in Table I. Still other criteria of Table II bear oblique resemblances to those of Table I, although even with spontaneity, which has a longer history, the context in which strategy criteria are embedded is far different from that of their differential counterparts. In the case of divergent strategy criteria, a comparison of Table III and Table I will be less instructive, since parallels are not readily seen.

Burkhart attempted a description of these two strategies utilizing the criteria from Tables II and III (but not in the same order). These descriptions will be given here. (The numbers are merely a counting device, and do not refer to the numbers of the criteria in Tables II and III.)

In art works, the most critical point of detection determinant of the strategy is the beginning stage. Figure 3, p. 33, shows that Spontaneous students begin (1) with a big organic statement devoid of detail but suggestive of a whole picture. This initial statement is (2) enriched by a diversity of strokes which allow, through (3) media overlays, for (4) the incorporation of accidental forms as a source of process inspired changes essential to the (5) progressive development of the work as an organic unit. Action is evident in the brush work which varies from the use of (6) direct forceful flowing movements to (7) direct abrupt quick motions that are usually interwoven with (8) erratic wandering fine lines which convey the impression of (9) movement within shapes, intensifying the (10) action gestures resulting from the distortion of the contours of the elements of the subject matter. This freedom in procedure leads the spontaneous student to (11) reliance on suggestion for completeness, not elaboration. As the work progresses shapes are stated rapidly with (12) open and broken contours and (13) rough and varied edges, creating (14) patterns of broken lights within darks throughout the picture's surface, which sometimes in the bigness of the forms suggests (15) a network of spaces through voids surrounded by dynamic dark forms. It is principally by the composition's (16) central emphasis that the picture is

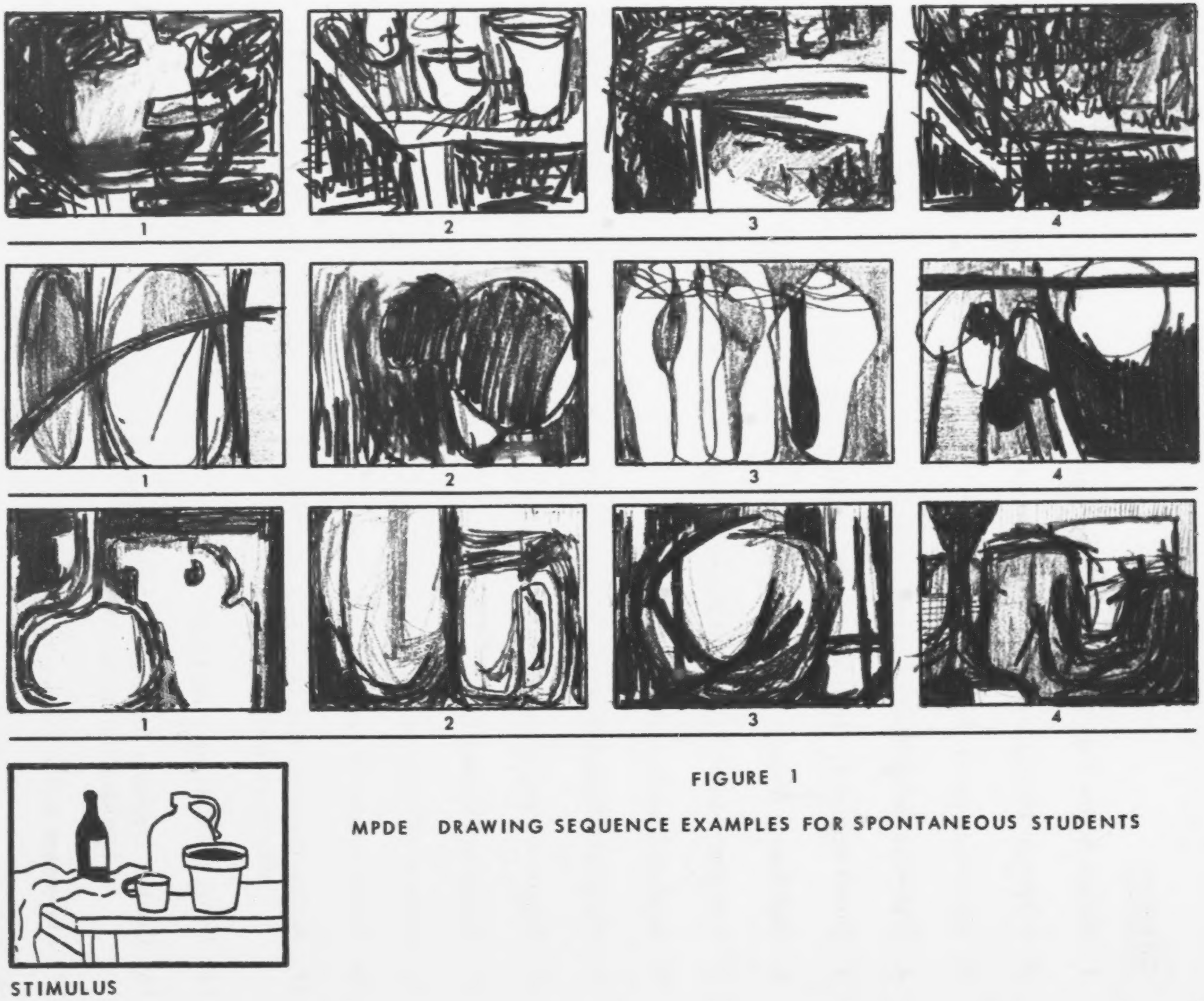

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FIGURE 1

MPDE DRAWING SEQUENCE EXAMPLES FOR SPONTANEOUS STUDENTS

TABLE II

Internal or Intra Strategy Complexity Judgment: Scaled Spontaneous Criteria Arranged in Descending Order of Rarity

Criterion	% (N=96)
1. Heavy Action Forms in Space (Disconnected)	14
2. A Spatial Network through Voids Surrounded by Dynamic Dark Forms	14
3. Movement Across Forms and Contour	17
4. Web-like Solidification across Objects	21
5. Direct Forceful, Flowing Movements (circular or long)	22
6. Enrichment through Diversity in Strokes within Picture	28
7. Incorporation of Accidental Forms (Process-Inspired changes)	30
8. Medium Overlays (Interaction)	31
9. Open and Broken Contours (not at joints)	31
10. Suggestive Big Organic Statement from Start (in scale) Devoid of Detail	33
11. Rough and Varied Edges	36
12. Patterns of Broken Light within Darks	37
13. Direct Abrupt Quick Motions	38
14. Action Gestures (resulting from the distortion of the contours of the subject matter)	42
15. Erratic Wandering Fine Lines	46
16. Central Emphasis (through the balancing out of the dynamic elements in juxtaposition to each other)	49
17. Movement within Shapes	54
18. Reliance on Suggestion for Completeness, Not. Elab.	55
19. Progressive Development of Work as an Organic Unit	64

TABLE III

Internal or Intra Strategy Complexity Judgment: Scaled Divergent Criteria Arranged in Descending Order of Rarity

Criterion	% (N=96)
1. Only Single Element (for subject matter)	20
2. Transparencies and Overlapping Spatial Planes	23
3. Theme or Variation within Picture (same element varied)	23
4. Off Center Composition Off Balance	24
5. Unexpected Organizational Progression	30
6. Decorative Patterns (Detail)	30
7. Black-White Negative Reversals	31
8. Edge Contrast Edge to Edge (tensional)	34
9. Fine Line Control	37
10. Begins with Single Element	37
11. Static Spatial Suspension Floating (no base line implied)	37
12. Constructed Spatial Network Connected (welded together)	38
13. Single Element Focus	41
14. Early Inclusion of Detail	42
15. Formal Distortion (Static, drawn out, elongated abstract)	43
16. Progression of Theme Picture to Picture, Period to Period	44
17. Variation of the Same Element Picture to Picture (form not just treatment)	45
18. Change in Size Internal Scale Alteration	45
19. Black-White Contrasts (Solid)	51
20. Elimination of Non-essentials (less cluttered)	55
21. Flatness (picture as a whole in pattern)	67

held together, through the balancing out of these dynamic elements, which are further integrated by the open spatial patterns of brush strokes which in their diverse (17) movements across forms and contours sometimes achieve a (18) fused or web-life solidification of objects into a dynamic, abstract, monumental unit, or (19) heavy action forms in space. Spontaneous students begin with wholeness, and their objective is to give increasing vitality to the whole through suggestive progressive interaction.

In the first photograph, taken after just three minutes of work, the Divergent student's way of working is clearly distinguished from that of the Spontaneous student. (Consult Figure 4, p. 35, for examples of the divergent strategy.) Divergent students begin their picture by drawing with considered (1) fine line control (2) a single element which in some portion shows the (3) early inclusion of detail. They sometimes draw (4) only a single element but more often their work reveals a (5) single element focus which when compared to the stimulus object in shape shows intentional (6) formal distortion in contour which is frequently still further emphasized by the inclusion of the same object again within the composition, with further deviations from its form as a (7) theme for variation on this specific subject matter. A closely related from of change in focus pertaining to subject matter alteration is that of (8) changes in the internal scale of objects in their size relationships, often depicted through the use of (9) transparencies and overlapping spatial planes. The process photographs further reveal that as the picture evolves (10) unexpected organizational progressions usually occur, sometimes resulting in (11) an off center composition which is off balance, utilizing (12) edge contrasts, from edge to edge of the picture frame, which also contains some detached objects held in a state of (13) static spatial floating suspension. Near the conclusion of the work (14) flatness in the pattern of the picture as a whole is frequently achieved through the use of (15) decorative patterns and (16) solid black white contrasts that sometimes are in the form of (17) black white negative reversals of objects in space as inter-connected parts of a (18) constructed spatial network. Over a series of works there is often (19) some elimination of non-essentials and sometimes (20) variations of the same element from picture to picture, which may be included as the basic elements in (21) a progression of pictures from one work period to the next.

In their art divergent students reveal a constant alteration of viewpoint and controlled shifting of focus within a designated framework in their persistent search for conceptual variety through their systematic openness to emerging possibilities for innovation as they work. Their divergency constitutes a synthetic, elementalistic strategy, dependent upon conceptual flexibility, organizational clarity, and freedom for discovery.

Further discussion of art strategy criteria will occur in sections on judging and in Chapter IV (Analysis).

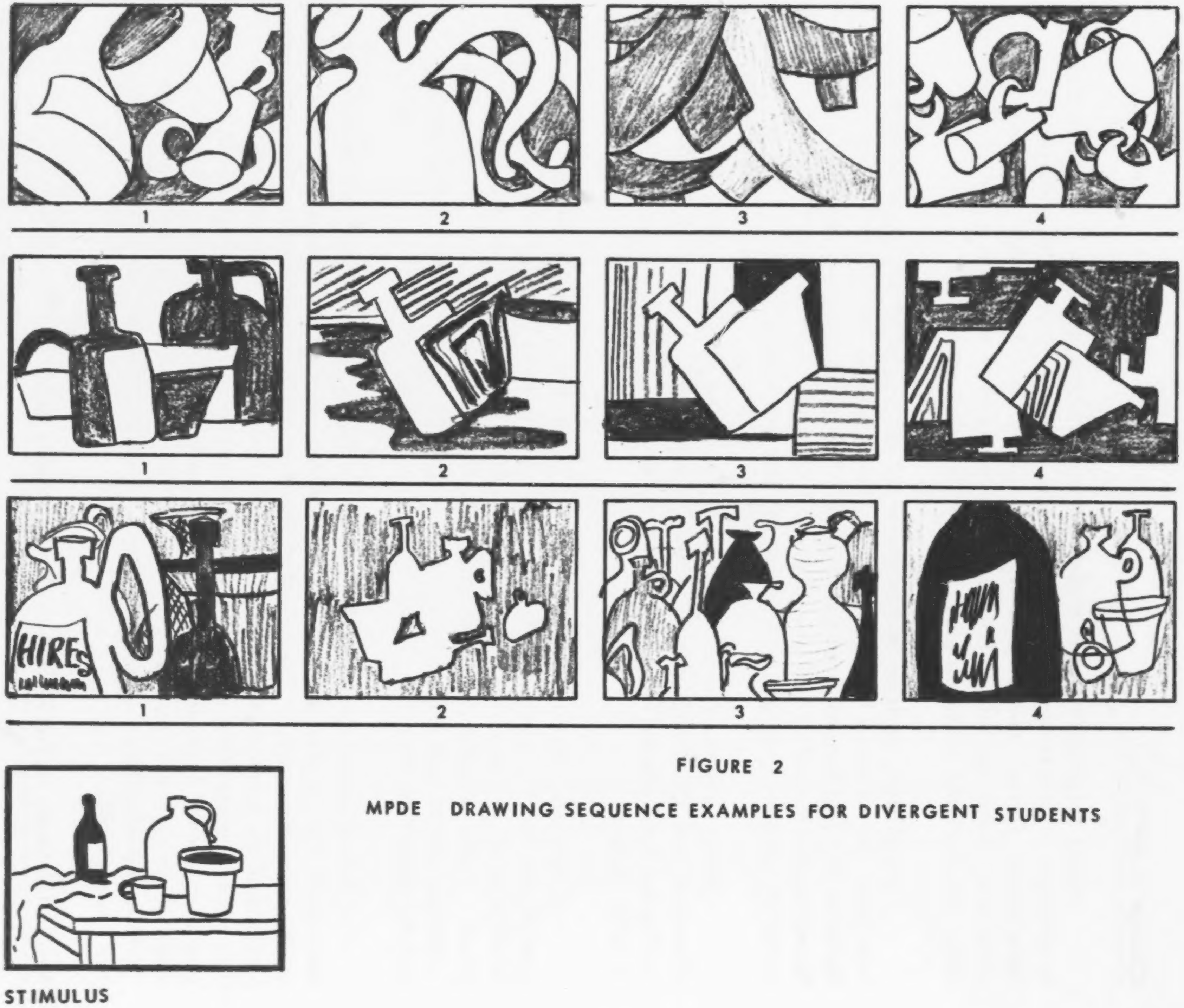
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FIGURE 2

MPDE DRAWING SEQUENCE EXAMPLES FOR DIVERGENT STUDENTS

III. Revision of Dependent Variables Representing the Capacity for Creative Action

Change in Art Criteria

Once progress had been made on the art criteria problem through the isolation of differential criteria falling into three non-overlapping domains, (designated spontaneity, formal, and divergent), need for revision of predictors of former art criteria followed logically. Prior art criteria had been aesthetic quality and spontaneity only and had relied on global or gestalt judgments.

In addition, revision and extension of existing predictor batteries had been intended. As reviewed in Chapter II, earlier studies by the author (5, 10) and by Burkhart (25) had demonstrated that high multiple correlations were possible with the former aesthetic quality and spontaneity art criteria. A change in the structure of the criterion, however, suggested a search for new predictors.

Along with the domains located on the differential art criteria, a fourth dimension was added and labeled, simply, "evaluation." Although the search for such a criterion area proved to be abortive, the tentative first definition of it may be of use in later studies.

The author attempted to define a subject's ability to evaluate art objects in operational terms. It was assumed that the more criteria a subject could apply to a set of objects which actually rearranged their orders for him, the greater his evaluative power. Eight drawing sequences from Nitschke's Multiple Purpose Drawing Exercise (55) were reproduced and became the objects to which the subject was to assign criteria and the orders for them.

This dimension was used for pre-test with the junior sample and then dropped, because it did not seem to be on the same plane, as an instrument and on face validity, as the other dimensions. The actual evaluations subjects made during the evaluative sessions of the experiment were felt to be a more proper and solid base for further study. The general importance of the evaluative power or complexity of a subject becomes apparent when it is pointed out that all of the independent variables of this study were applied during the evaluative sessions, on the assumption, as earlier stated, that "different evaluations...lead to different forms of behavior" by the route of modifying the "image" (53).

Prediction Study at Pre Testing of Junior Sample

Using the four art dimensions--spontaneity, formal, divergency, and art evaluation--as targets, an extensive battery of tests was administered to 52 art education juniors at The Pennsylvania State University. This sample was the entire sample

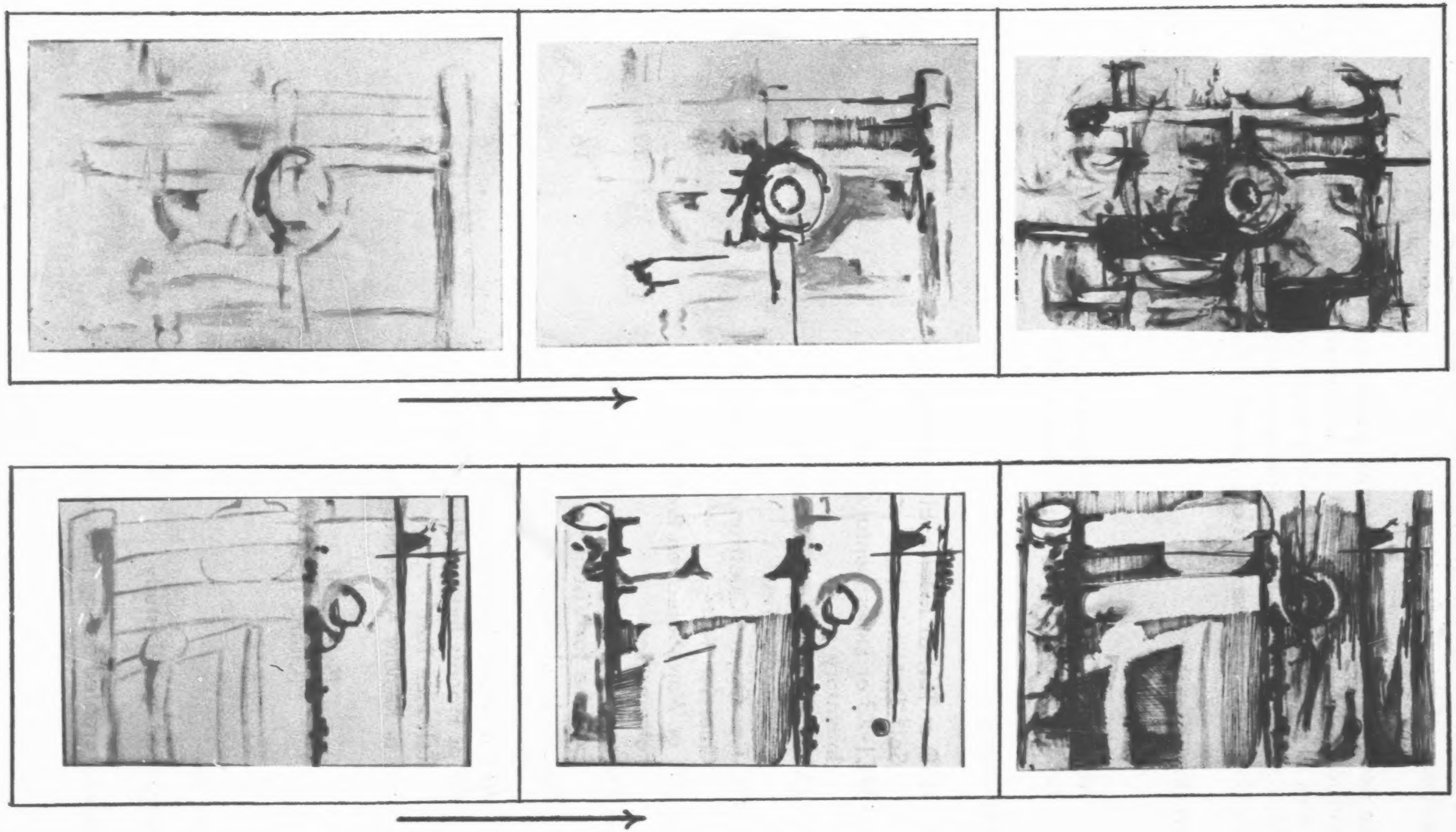

FIGURE 3

PROCESS SEQUENCES ILLUSTRATING THE SPONTANEOUS STRATEGY of available junior art education majors and became the first group to participate in the major experiment of this study.

The battery included 12 different paper-and-pencil tests or tasks, 4 of these newly constructed for this purpose and in most other instances the remainder with new keys or scales as revised on art and non-art major college undergraduate samples from Central Michigan University, Indiana (Pennsylvania) State College, and The Pennsylvania State University. These tests are named as follows:

(Art dimensions)	Number of Scores or Judgments (including compounded scores)
1. Multiple Purpose Drawing Exercise	38
2. Art Evaluation Task[1] (Sub Total = 42)	4
(Predictors)	
3. ISSD or Test of Ideational and Social Self-Determination[2]	16
4. BBCI-X3 or Experimental Creativity Inventory	26
5. FAT or Flexibility and Abstract Orientation Test[1]	3
6. OQT or Object Question or Divergent Question Test[2]	13
7. SDT or Word Selection Preference Patterns Test	20
8. VM or Visual Magila: an Experimental Exercise for Visual Preference	16
9. Process Involvement Recall from Product Stimulus	6
10. WET or Word Equation Test[1]	6
11. PIT or Process Independence and Self-Reliance Test[1]	7
12. RAT or Remote Associates Test	7

(Sub Total = 120)
(Grand Total = 162)

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[1] Developed for this study.

[2] Manual created during this study.

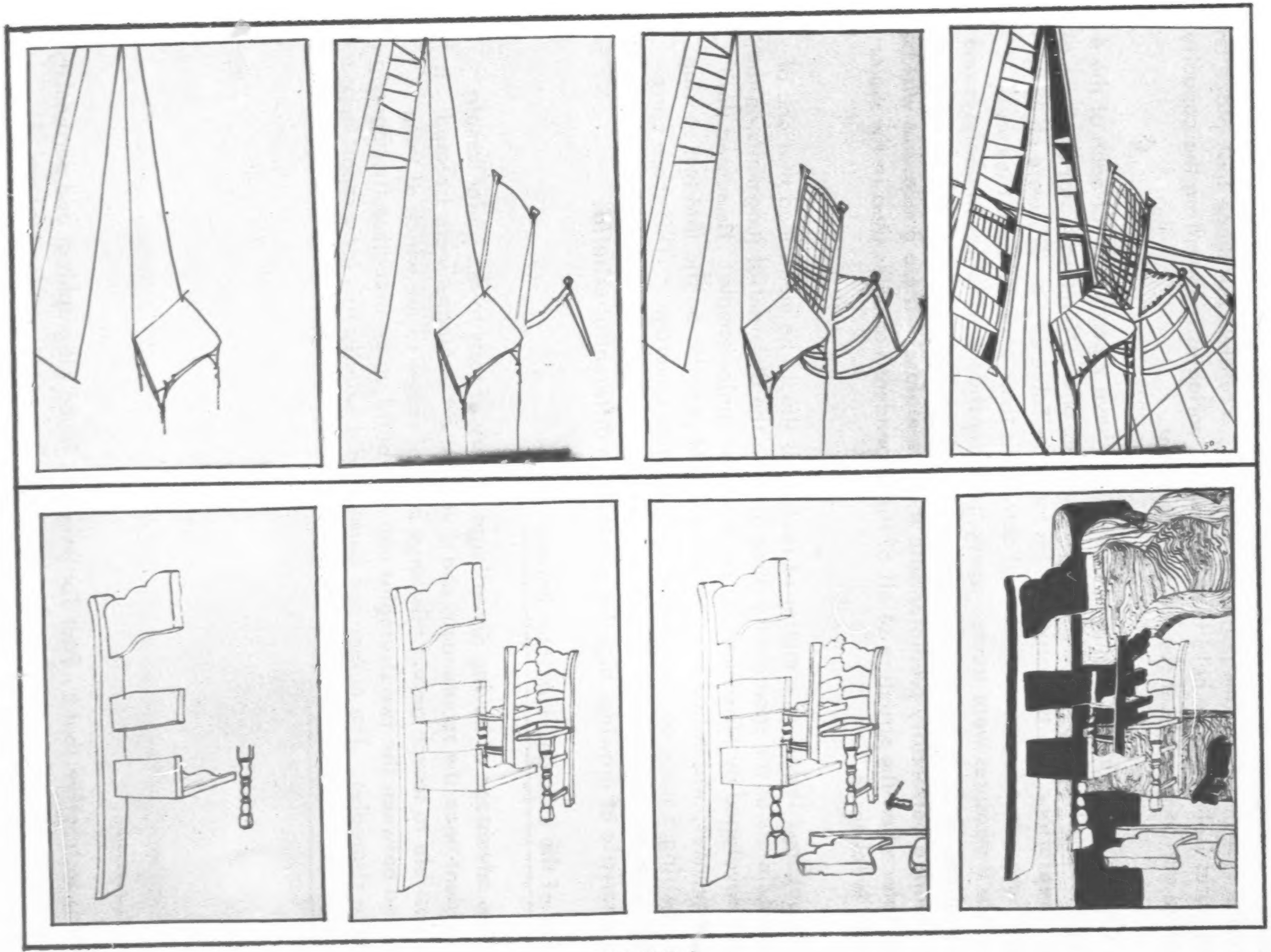

FIGURE 4

PROCESS SEQUENCES ILLUSTRATING THE DIVERGENT STRATEGY

Descriptions of these 12 tests are given in Appendix B, pages 143 to 155, along with test item examples, where appropriate.

To be sure, 162 scores are far too many to deal with in experimentation, but the predictor system was deliberately opened wide at this point to match the broadened art criterion system. From this point on, however, a ruthless skrinkage took place and the 8 measures isolated were held to as dependent variables representing the capacity for creative action throughout the major experiment.

Choice was guided by the simple desire to have 2 predictors for each of the 4 art dimensions. After scanning correlation matrices and performing factor analyses and multiple correlations, the 8 measures to be found in Table IV, p. 37, were chosen. Although there was a logic, as presented above, in their choice, once they were chosen these 8 measures were treated as separate dependent variables in analyses and were not related back to the 4 art dimensions. The method of choice was to assure a broader creative personality predictor base than heretofore. These 8 measures will be discussed later when the structure of all of the dependent variables used in the major experiment is taken up.

In passing, if only as a matter of record, it should be mentioned that one of the high predictors of the spontaneity dimension on the differential judgments on the MPDE was developed by Nitschke (55) on this same junior sample. He scored the drawing sequences, which had been made with IBM pencils, on the IBM test scoring machine, getting a score on "blackness" or "graphite coverage." This score correlated .400 with the spontaneity dimension, giving a value free description of at least one characteristic of drawings high on spontaneous differential criteria.

Other Uses of the Enlarged Predictor Battery

One advantage of having given large battery of tests to the junior sample became evident once the spontaneous and divergent art strategies were isolated. It was then possible to search among this large pool of scales to see which of them discriminated between the two strategies and thus build up an inductive first description of these strategies. The author and Burkhart did exactly this for a report appearing in Studies in Art Education (11). In general terms, the following descriptions[1] emerged:

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[1] It is instructive that E. Paul Torrance has found biographical and personality differences between "originators" and "elaborators" as identified by his tests of creative thinking for children (personal communication with the author).

TABLE IV

Intercorrelations of Measures Representing the Capacity for Creative Action and Pre Test Differential Art Criteria Totals on the MPDE for the Junior Sample
N=52[1]

Capacity for Creative Action

	Spontaneity	Formal	Divergency	Art Self-Evaluation[2]
Set 1 (ISSD)				
Complexity	.362[3]	.230	.198	.197
Aestheticism	.234	.062	.495	.108
Theory	.219	.256	.217	.377
Social Self-Determination	.320	.272	.168	.156
Set 2				
Originality (BBCI-X3)	.186	.375	.441	.085
Creative Independence (BBCI-X3)	.340	.425	.490	.275
Flexibility (F.A.T.)	.317	.214	.075	.037
Object Question Test	.039	.398	.361	.487

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[1] Four cases were dropped at post test because of incomplete data.

[2] This dimension was later dropped because of low reliability, and scoring and retest problems. Basically, it required a subject to order 8 sequences from the MPDE in as many ways as possible, according to criteria specified by the subject.

[3] The two underscored relationships for each Art Criterion Dimension are those of the two measures chosen as predictors of that domain. Note that the highest correlation of a dimension was not necessarily chosen, but usually the predictor's highest relationship (Creative Independence and Social Self-Determination are the exceptions.

	SPONTANEOUS	DIVERGENT
1. Social Orientation	Exuberance	Self-Restraint
	Independence	Tradition
	Self-Confidence	Self-Consciousness
2. Work Orientation	Procedural Flexibility	Conceptual Flexibility
	Freedom in Process	Control in Process
	Holistic Viewpoint	Synthetic Viewpoint
	Controlled Problem Focus	Unexpected Alteration of Viewpoint
	Kinaesthetic Orientation	Field Orientation
3. Background	Turbulent Environment	Supportive Environment

IV. Art Judging Procedures

Three Kinds of Judgments Utilized in This Research as Dependent Variables

The three kinds of judgments applied to art objects in this study have been alluded to in prior sections. Here will be given a more detailed description of how these kinds of judgments took place. There are two reasons for the varied kinds of judgment employed: (1) advances in knowledge and methodology of judgment during the time of this research, and (2) the desire to relate newer approaches to judging to older ones, and hence to the literature.

Differential Criteria Judgments

The three graduate research assistants who had realier worked with the author and Burkhart in the search for differential criteria and in the domain mapping effort described at the beginning of this chapter, became a judge team which applied 13 differential criteria and 4 global or gestalt judgments to 96 drawing sequences of the kind shown in Figures 1 and 2, pages 27 and 31. This set of drawing sequences were done at pre and post test by the 48 juniors (sample 1) of the major experiment. All signs of identity as to student and pre or post test occasion were concealed, and the objects were randomly displayed in a standard format of presentation. The 17 separate criteria were arranged in random order for each judge and one criterion at a time was judged over the entire 96 drawing sequences. The judgments included the 12 criteria listed at the top of Table I, page 24, and the 4 global judgments shown at the bottom. The reason for there being 17 rather than 16 was that criterion 1 under the formal domain, overlap-transparency, was separated into two, one for overlap, the other for transparencies, because these spatial treatments were occurring separately in the drawings.

While exact reliability estimates on this one sample were not computed for individual judgments, lower limit estimates for the globals (as separated out into N's for pre and post of 48 each) can be read from Table 36, Appendix A, page 138. For team totals, these would read: spontaneity = .698; formal = .752; divergent = .698; and aesthetic quality = .752. These are certainly minimal estimates, based on highest intercorrelations of those shown, for half the sample of objects. Table 33, Appedix A, page 135, shows judge with judge intercorrelations on the 5 man judge team involved in the domain mapping study. All of the 138 judge with judge intercorrelations are significant at the .05 level, and all but 3 at the .01 level. Three of these same judges were the team for the judgments described in this section.

Internal or Intra-Individual Judgments: Art Strategy Complexity

This judgment was performed by the author and Burkhart. The procedure for judgment will first be described. A subject's entire studio production was spread out before the judges. These data were in the form of 3-1/2" x 5" photographic records of processes and products made during four 75 minute studio periods. On the average, 3 end product shots and 3 process shots (taken at 3, 6, and 9 minute intervals while one of the 3 end products was developing), were available for each of the 4 studio periods, or 24 photographic records in all for each student, or, roughly 2,304 records for the 96 students in the major experiment.

The work was ordered by studio periods and affixed to large sheets of brown wrapping paper, folded into 4 panels, one for each week or studio. The judges took students one at a time and in random order. The influenced or later studio periods were compared against the first week or uninfluenced studio and a careful check made by means of the 40 criteria listed in Table II, page 28, and in Table III, page 29. Each criterion was taken and the question asked: Is there evidence of greater intensity of this criterion in later studios as compared with the bench mark studio, or is it later present if absent to begin with? If the answer was yes, a point was awarded on the strategy from which the criterion came. This procedure, while basically simple and straightforward, required at least one hour's careful study of the process samples of each student. On the average, 6 such judgments were completed in an 8 hour day.

Since this judgment yielded a simple total for each strategy, which was composed of the "parts" or "tactics" of the strategy, it was thought of as an art strategy complexity score. Since it was a judgment of the strategy of one person at a time, it was called an intra-individual or internal judgment.

It is realized that this approach is a mere beginning at the study of art strategies or of the inner dynamics of change in art. In terms of the characterization, properties, and actions of general systems theory as described by Maccia (46), the judgment here described deals with "dynamic relationships of entities," since the properties of the entities change or become discernible with time. To pursue the analogy further, each person is seen as a "multisystem," since two molar units, the

2

strategies, are usually discernible in some strength in each person's work. The person, as a system, has "hierarchical ordering," since in almost every instance one strategy assumes dominance over the other with time. The ratio observable was 3 to 1, on the average. The person is "centralized," thus, because an entity or set of entities dominates the actions of the system. Other such parallels are instructive, if not conclusive but will not be pressed at this time.

Many aspects of such judgments as here described need study. As an example, consider the questions: How much of a change in criterion represents "more"? When is a criterion present? What are judge differences in detecting "just noticeable differences" in works? Would the 40 strategy criteria make any sense if applied as scales in a comparative judgment, across randomized individuals and studio periods? These and other such questions await further study.

The question of the reliability of this new kind of judgment must be faced. The author and Burkhart worked as a team. In the study by Teed (68), team judgments of the comparative type were seen as comparable with individual judgments and the relationship between two different teams of judges was very high. In Uhlin's study (70), in assessing aesthetic quality of art objects, essentially the same result was obtained when a judge screened a "package" containing all of an individual's works as compared with screening each work independently, separated in time and placement by other works. Thus some precedent for the present approach, in a general sense, exists.

To compare teams on art strategy complexity judgments, the author and Burkhart judged the first two studios (uninfluenced by treatment) of the teaching study sample (N=31). Two graduate research assistants trained in the usage of the 40 art strategy criteria did likewise. Only in 2 out of 31 instances were there disagreements in strategy placement, or, conversely, there was 93% agreement between the two teams.

Tables 46 and 47, Appendix C, pages 167 and 168, indicate that comparative or external judgments of strategy, as made by a 6 man judge team, working independently, show increasingly high relationships with the internal or art strategy judgments in the later studio periods. For example, external and internal judgments of spontaneous strategy rise from a correlation of .317 for studio one to .559 for studio four; while comparable figures for the divergent strategy go from .130 to .682. As Table 54, seen in Appendix C, page 187, demonstrates, the over-all relationship between the two kinds of judgments of spontaneous strategy correlate .753, while for the divergent strategy the corresponding figure is .748. Thus the reliability and objectivity of the internal or strategy complexity judgment is strongly supported.

External or Comparative Judgments

After the internal judgments were completed, the individual studio panels of each subject were separated from each other and a coding system put into effect to mask the identity of studio periods and individuals. The 384 panels (96 x 4) resulting from the major experiment were randomized in preparation of what has been called a comparative or external judgment, to distinguish it clearly from the internal or intra-individual strategy complexity judgment where the entire set of works of one person at a time was judged.

A six judge team was set up. Two judges were faculty members in the Department of Art Education at The Pennsylvania State University. The remaining four were graduate assistants, all of whom were doctoral candidates in the same Department, and all of whom had taught art at the college level. The team was so chosen that 3 judges were included whose own art work was more in the spontaneous strategy and 3 whose work was more in the divergent strategy. This selection of the judges on the basis of what they were judging was done to further knowledge of art judgment problems and as a safeguard against possible insensitivity in judging a strategy opposite from one's own, or hypersensitivity in judging within one's own strategy.

A random order for judging three criteria was assigned each judge and all judges were given the following instructions:

Judging Instructions:

> Follow the order of criteria for judging as assigned to you, judging the first listed criterion over the entire 384 panels before going on to criterion two. Help will be provided in recording judgments once they are made.
>
> Proceed by sorting works (panels) into a high, average, and low pile. Then sort each of these into 3 finer gradations, so that you will end up with a 9 point scale composed, insofar as possible, of equal appearing intervals. Try for as rectilinear a distribution as possible (that is, flatten out the center as much as you can to force discrimination).

Minimal Definitions:

I. Aesthetic Quality (AQ): A gestalt good to poor evaluative judgment taking into account formal, expressive, and creative factors as sensed through personal judgment. Judge the end products on each panel as a whole.

II. Spontaneous Strategy Complexity (SpCo): A judgment of the comparative complexity or number of parts sensed in the process series on each panel. To aid in the likely occurrence of the criteria, they are listed in scalar form from rarest to most popular and percentages accruing over previous judgments of individuals are given.

III. Divergent Strategy Complexity (DvCo): The same kind of judgment as described above for SpCo. Divergent Criteria are also listed in scalar from with percentages.

On accompanying pages, strategy complexity criteria were presented, much as they are given in Tables II and III, pages 28 and 29. Each judge was also trained in the use of these criteria on samples of works not included in the study. While training in the parts was given, along with further definition and examples where needed, it should be pointed out that judges did not make judgments using the 40 strategy criteria directly. They used the same global or gestalt assessment procedure as in the case of aesthetic quality--that is, they sorted works, for example, into high, average, and low piles, then into high-high, average-high, low-high, high-average, average-average, low-average, high-low, average-low, and low-low. Thus a 9-point scale was generated. The necessity of handling each panel twice, once for coarse and once for fine grouping, was an added sensitivity attained by this method.

Tables 38 through 46 in Appendix C, pages 159 through 167, summarize relationships between criteria and judge sub-teams for the external judgments. Several observations will be made at this point. Lower limit and upper limit reliabilities of judges may be estimated by averaging the 15 judge to judge correlations on the lower side and the 6 judge to total judge correlations on the upper side:

	Lower limit	Upper limit
Aesthetic Quality	.401	.702
Spontaneity	.675	.855
Divergency	.535	.768

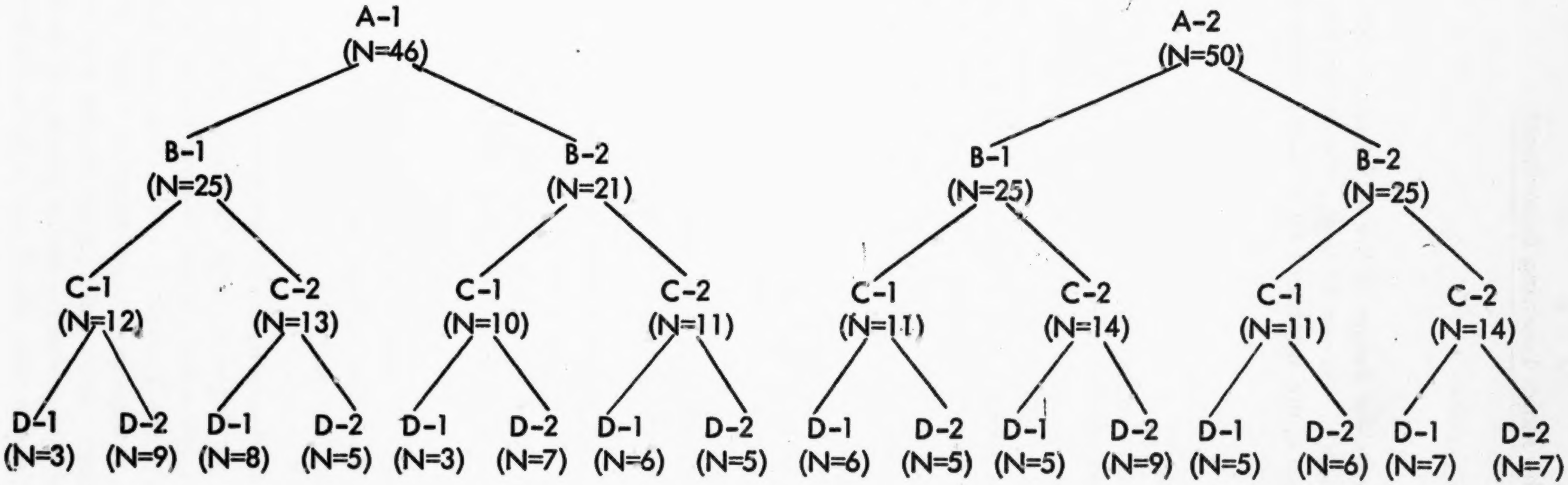
By these figures, judges are seen to be most variable on aesthetic quality and least variable on spontaneity.

Further reference to the tables of Appendix C will show that the relatively high correlation between aesthetic quality and spontaneity is brought about largely by the spontaneous judge subgroup, who see these qualities more related (r = .663) than the divergent subgroup (r = .225). The reverse is only moderately as expected with divergency and aesthetic quality, being -.119 for the spontaneous judges and .139 for divergent ones.

Each judge behaved as predicted in all 3 kinds of judgments--that is, he agreed more with his subgroup than with that of judges of opposed strategy. Spontaneous judges in all instances had higher standard deviations than divergent judges. Divergent judges saw the two strategies as more opposed (r = -.718) than spontaneous judges (r = -.538).

TABLE V

Design of the Major Experiment
N=96


A-1
(N=46)
A-2
(N=50)
B-1
(N=25)
B-2
(N=21)
B-1
(N=25)
B-2
(N=25)
C-1
(N=12)
C-2
(N=13)
C-1
(N=10)
C-2
(N=11)
C-1
(N=11)
C-2
(N=14)
C-1
(N=11)
C-2
(N=14)
D-1
(N=3)
D-2
(N=9)
D-1
(N=8)
D-2
(N=5)
D-1
(N=3)
D-2
(N=7)
D-1
(N=6)
D-2
(N=5)
D-1
(N=6)
D-2
(N=5)
D-1
(N=5)
D-2
(N=9)
D-1
(N=5)
D-2
(N=6)
D-1
(N=7)
D-2
(N=7)

Factor A-1	Self-Discovered Criteria	N=46
Factor A-2	External Criteria	N=50
Factor B-1	Process Feedback	N=50
Factor B-2	Product Feedback	N=46
Factor C-1	Interactive Setting	N=44
Factor C-2	Independent Setting	N=52
Factor D-1	Spontaneous Students	N=43
Factor D-2	Divergent Students	N=53
	(Juniors	N=48)
	(Freshmen	N=48)

V. The Major Learning Experiment

Experimental Design

Table V, page 43, presents the design of the major experiment of this report, giving factor names and subclass N's. As can be seen, the design has 4 factors of 2 levels each. Factors A, B, and C are treatment conditions, while D is an organismic or classification factor.

Population and Sample

The experiment was run on two separate time blocks. The first phase was with all of the junior art education majors of the Department of Art Education, The Pennsylvania State University, and took place during the Spring Term, 1963, with paper-and-pencil pre tests given at the end of Winter Term, 1963. This latter arrangement was to give sufficient time to score and examine the great number of pre tests given the juniors prior to the beginning of experimentation. It was also necessary to judge the drawing sequences (MPDE or DBS) in order to plot predictors against pre test art data (these sequences were rejudged later, in more detailed fashion, after being randomly mixed with post test sequences).

The second phase of the major experiment took place in the Fall Term of 1963. The population sample in this instance was made up of the freshman art education majors in the same Department. This choice of sample was deliberately made as a comparison of learning levels and differences in response to treatments that might be discernible between upperclassmen and lower classmen.

The total sample was 96, 48 juniors and 48 freshmen. There were 6 males in the junior sample and 7 males in the freshman sample, or one male to 6.4 females, a ratio typical of undergraduate teacher preparation samples. Male representation was too small to ascertain any possible differences between males and females in response to experimental conditions.

The total of 96 is the resultant usable figure of participating students. For health and other reasons, there was about a 5 per cent attrition rate. Only cases with full data available were retained for analysis.

Subjects were assigned randomly to the 8 treatment cells representing the different treatment conditions. As Table V, page 43, shows, factor C is the most imbalanced of the treatment N's (44 and 52 respectively), factors A and B being only 4 apart in the N's associated with the 2 levels in each. The spontaneous vs. divergent classification groups, factor D, is disproportionate because it represents the natural breakdown occurring when students' works were judged by the external judge team. When the judgments were sorted into period by period groups, students were classified as to their dominant strategy at studio one, which was prior to treatment influence.

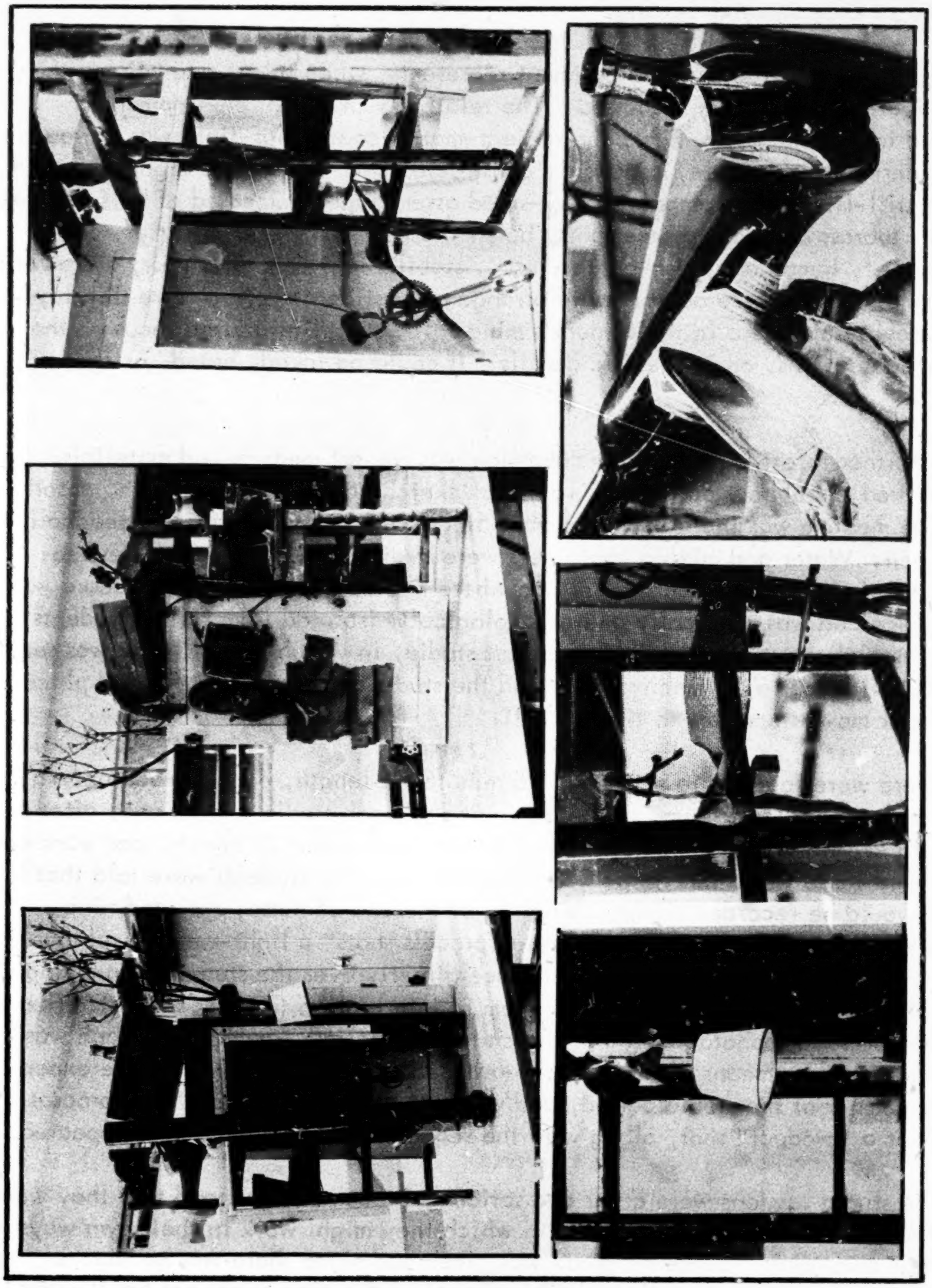


FIGURE 5

STILL LIFE CONSTRUCTION USED IN THE EXPERIMENTS

This system was felt to be the most defensible for the inclusion of this classification variable, even though it caused the most severe disproportionality in the design (at the fourth level).

Description of Experimental Setting

Symbolically, the major experiment represents, when taken as a whole, the theory of learning previously discussed. The relatively invariant environment is represented in several ways: First, the subject-matter or stimulus-field was, throughout the experiments, a single, complexly constructed still-life. (See Figure 5, page 45.) This still-life was a compact, many-sided assemblage, composed of half a wooden chair, half a brass bed post, flower pots, bottles, slender branches, thistles, an electric socket, lampshade, egg-beater, etc., stabilized by a center post, a drawer, and a cabinet door. These objects were arranged in deliberate associative disarray to stimulate new visual ideas in the student's mind. The still-life invited focus on the whole, on subsections, or on specific details. It could be loved, hated, or ignored, and was.

A further relatively invariant condition was the art medium and materials. The student worked throughout on a 12" x 18" thick sketch pad of white, smooth, absorbent paper. The medium was india ink, a number 5 Japanese brush and a C-5 Speedball lettering pen. Water and mixing containers were available for washes, if desired. Each student worked on a large flat surface where he had approximately 2 square yards of table space and was physically and psychologically isolated from fellow students. Groups averaged about six each to a large art studio, in which the still-life was set in the middle, with the tables encircling it and the students told that they could place themselves or move from time to time at will.

There were four studio periods of 75 minutes in length, each a week apart. Students were told to "warm up" at the beginning of each studio session and, after an interval, to begin their work. Normally, students took about 20 minutes per work and thus averaged three works per studio. On the first picture, students were told that its evolution would be recorded photographically at the end of three, six, and nine minutes and upon its completion. For these "process shots" a light-weight welded frame to which a camera was affixed was place directly over the student's on-going work which was photographed with a minimum of interruption (3 to 5 seconds). The completed works were photographed at the end of the period. Each photograph was coded when taken by means of labels designating the student's number for the experiment, the number of the studio period, and whether it was a "process," or "process-product," or a "product" shot, along with the sequential order in which it appeared.

The studio sessions were quiet and serious. Students understood that they were in an independent learning environment in which they might work in their own ways toward their own goals. Since no grade was given and since there was no teacher present, they felt free to experiment and explore in ways they might not have under instruction. By removing external objectives, supervision, and evaluation from the studio session, a value neutral atmosphere was established in which the student progressively realized that the responsibility for learning was in his own hands. By this method, in opposition to the purely external treatment concept, the student was indirectly encouraged to be more wholly himself in the privacy of the art dialogue and his values were accepted as within the structure of the experiment.

The studio sessions just described were the same for all students and represented the relatively invariant environment which is thought to aid learning. Process feedback and the evaluation of products in relation to goals were clearly separated from the studio sessions to formally represent the self-reflective phase of learning in art. Thus the studio session of the experiment symbolizes the activity phase, and the evaluative session symbolizes the self-reflective phase of the art activity. The separation of the self-reflective from the studio phase has both an experimental and theoretical rationale. In terms of experimentation, this separation permits the systematic variation of feedback and evaluative conditions. In terms of the earlier theoretical discussion, the self-reflective phase is seen as the only one in which learning in art can be influenced without violating the privacy of the art dialogue. It is also the phase which is educationally or instructionally, and experimentally, accessible.

Independent Variables

1. Factor A was concerned with the content and locus of self-reflective feedback. Its 2 levels were specifically designated as self-discovered (A-1) as opposed to external (A-2) evaluative criteria. Self-discovered meant that the student stated his own criteria for evaluation of his work. Any criterion was acceptable as long as it had meaning to the student. One girl, for example, used the criterion "stop scratching over." This referred, in her own idiosyncratic language, to her tendency to overwork. External meant that the student was given criteria which approximated, in generalized terms, those criterion domains described at the beginning of this chapter. The criteria given the student were "freedom, originality, and form," to correspond to the spontaneous, divergent, and formal differential domains. These global criteria were given more detailed definition by accompanying printed statements which discussed the criteria listed in Table I, page 24, and gave examples of their meanings.

A standard form was provided for both the self-discovery and external group. (For an example of this form see Appendix D, page 171.) This form was identical for both groups except that for the external group the form had the criteria "freedom, originality, and form" printed on it, whereas the self-discovery group had to state their own criteria each time. In the latter case, students could change their criteria if they decided to do so, but no indication was given as to whether they should or should not do so.

As shown by the example in Appendix D, page 171, the evaluation form was divided into three parts. The first required a specific judgment for each in-process or end-product photograph, on each of the 3 criteria, in comparison with all of the other in-process or end-product photographs for that studio period and any previous ones.

The second part asked for reasons for judgments made under each criterion. Part three asked for actions to be taken in the next studio period for improvement on the criteria.

Rationale: Several pilot studies with broadly defined treatment categories suggested that student-initiated evaluation is superior to teacher-guided evaluation of art work in terms of student learning in art (10, 24), and also that student-structured learning objectives are superior to teacher-structured learning objectives in a given art task (64). These studies were more suggestive than conclusive. In this experiment an attempt was made to more closely define evaluative content and controlled evaluative settings, which could be observed in detail over longer periods of time. A further assumption held was that eliciting his own criteria may be more motivating to a student. Moreover, perception may be idiosyncratic to the point where generally stated and supplied criteria are ineffectual. The literature on creativity asserts than an external locus of evaluation will be detrimental to the creative processes of a student. A further philosophic consideration suggested by Rogers (62), is that an external locus inhibits the feeling of psychological safety and self-acceptance of oneself as of unconditional worth. There are problems as well as advantages to external criteria for the evaluation of one's own work. These are just beginning to become evident. Criteria detailed and flexible enough to apply in a general sense to an individual's working habits might be advantageous to the teacher, although knowledge would need to be derived on how to apply them educationally. There may be a persisting difference between criteria useful to the trained judge or researcher and those necessary to the student's learning. It may be naive to assume that criteria applicable in both settings need have the same form or content.

2. Factor B dealt with the form of the self-reflective feedback. Level B-1 was called in-process or, sometimes just process, and B-2 was called end-product, or product. In-process meant that a student was given for evaluation 3-1/2" x 5" photographs taken at the 3rd, 6th, and 9th minute during the production of one of his works. End-product meant that a student received for evaluation photographs of the three completed works he did each period. For each student, in-process or end-product photographs were mounted on 36" x 48" brown paper, folded into four 12" sections, each foot long section representing a studio period. In this way, each student could view his work as it accumulated from period to period.

Rationale: Prior studies (Schwartz, 64, particularly) indicated that a process emphasis in evaluation significantly affected gains in art achievement. It was therefore hypothesized that more individualized process information in visual form would be of value to the student in thinking evaluatively about his working habits in art. Art education theory has repeatedly stressed the educational importance of process over product focus (Lowenfeld, 44, Read, 59). A basic assumption of the field was thus put to an operational test.

3. Factor C was concerned with the setting for evaluation, interactive or independent. Interactive setting, C-1, sometimes referred to as presence of teacher moderator, simply meant that alternating teacher representatives interacted with the

student during the evaluative session under a defined format in which their purpose was to further the lead taken by the student. The teacher representative was not to make judgments or give information. He was acting, in short, like a Rogerian counselor, or in an accepting, interested, but neutral way. He was not to be stereotyped, but react "congruently," in Roger's terms, or like himself within these constraints. Independent setting, C-2, sometimes referred to as absence of teacher moderator, simply meant that a teacher representative was not present and that the student performed the evaluative task alone, utilizing the same form as that used in the interactive setting (where the teacher filled in the form under the student's guidance), but writing down himself his judgments, evaluations, and goal projections.

Rationale: Underlying the entire experimental design was the feeling that a "search for the teacher," in the abstract, was being conducted. Thus "instruction" was represented by the entire structure and setting of the experiment, since it was intended to be symbolically representative of basic conditions encouraging learning in art (and therefore stood for "assisted development "). It was assumed that the teacher's presence in interaction should yield greater learning increments than when the student worked alone; and yet, in terms of the prior discussion on the nature of the art dialogue and evaluation as seen from the subject's side, there is reason to question whether the interactive setting would be superior. It was further assumed that only those examples of teacher interaction which influence students' learning are essential teacher interactions. The complexity of this question is underscored by the only recently attempted at theories of instruction appearing in educational and psychological literature.

Art Dependent Variables

The kinds of art criteria to be used in this report for the analysis of the major experiment were described previously in this chapter under judging procedures. To recapitulate, these included: (1) differential criteria as judged on MPDE or DBS sequences (for the junior sample only), (2) external or comparative criteria, and (3) internal or intra-individual or strategy complexity criteria.

Dependent Variables Representing the Capacity for Creative Action

The 8 measures finally chosen for this purpose were described previously in this chapter and in Appendix B, pages 143 to 155. These 8 measures are sometimes referred to as the "predictor battery."

Structure of the Dependent Variables

Intercorrelations of all dependent variables and a factor analysis of these relationships will be presented as part of the analysis chapter.

Methods of Analysis

Several different methods of analysis were used in this report for the major experiment and the teaching experiment. The standard analysis of variance procedure reported on in Chapter IV was devised by Snedecor and Cox (65). Essentially, it is a method of analysis for experiments where there are unequal N's, and it is carried out by the method of expected subclass numbers. A correction for disproportionality is applied in cases where an exceeded chi square figure is obtained, the chi square being based on degrees of freedom represented in the experiment by conjunctions of factor levels (minus one).

In the major experiment, no significant disproportionality exists for a 3 factor (A, B, and C) analysis, but when factor D (the spontaneous-divergent classification) is added, a chi square of 6.1648 is obtained, exceeding the 3.84 test level set at the .05 level for one degree of freedom. Accordingly, a reduction factor of .9352 is used to reduce the mean squares in analyses of the major experiment. When factor D is dropped for analysis, the resultant chi square is .3243, far under the 3.84 test level.

In the teaching experiment, the test level for chi square is 5.99 (for 2 d.f., or 2-1 x 3-1 x 2-1 x 2-1). The chi square test for disproportionality is only .4047, hence no correction factor is needed.

In the major experiment, analyses were conducted which are not reported, to ascertain the effect of the method of analysis used herein. Junior and freshman samples were separately analyzed, with all factors showing similar trends as those noticed in the combined analysis, with possibly slightly greater clarity to the freshman sample.

Before a 4 factor program for unequal N's was available, data were run by means of a 2 factor unequal N's program, and main effects and simple effects were substantially as reported later.

At one point, by sampling down, and by placing subjects by predictor tests as well as by their first studio art on the spontaneous-divergent factor, a 4 factor balanced design was analyzed. Again, main and simple effects were as reported in the next chapter, but there were not the heavy third and fourth order interactions noted in the unequal N groupings. This was especially true on the dependent variables representing the capacity for creative action.

It was determined, however, that the unequal groupings were the most appropriate for the analysis of these data. It was further felt to be reasonable that heavy interactions between factor D and the other factors should occur, for reasons to be discussed later.

VI. The Teaching Experiment

Table VI, page 52, presents the design of what has been termed the teaching experiment of this report. A 4 factor design was used, with subclass N's as indicated in Table VI.

Essentially, this experiment attempted to ask more refined questions concerning preliminary findings resulting from the major experiment. The teaching experiment took place during Spring Term, 1964, under the immediate direction of Burkhart, with the design jointly planned by the author and Burkhart.

Previously, in Winter Term, 1964, a pilot teaching experiment was conducted with 18 junior art education majors. In this study, "teachers" (students in training playing the teacher role) were matched with "students" who were unlike them in working strategy--that is, a spontaneous teacher worked with a divergent student, and vice versa. Teachers and students interacted in an unstructured setting only during the evaluative phase of a series of learning studios. The studios themselves took place in small groups working from a constant still-life stimulus in a constant medium (the same as in the major experiment). In between each studio, the "student" and his "teacher" met to discuss the student's work. Both process and product photographs of prior work were made available. The dialogues occurring in this setting were taped and later analyzed by Jones (42). Since this report will be available, his findings will not be detailed here.

Analysis of the art in this pilot study was not attempted (apart from Jones' study), becuase it was largely a sensitizing operation to get at further delineation of treatment variables important in the interactive setting. Merging the sense of this pilot experience with partial findings from the major experiment, the 4 factor design of Table VI was originated.

As in the pilot study, the sample consisted of junior art education majors (N=31, one subject being dropped because of insufficient data). For those 31 students there were 8 "teachers," chosen because they were students whose work showed them to be exemplars of the strategies they represented.

Independent Variables for the Teaching Study

1. Factor A was concerned with the time placement of process feedback.

Rationale: It was known through preliminary analyses that process feedback was superior to product feedback, so that process feedback was retained as the form of feedback. The new question was whether closer process connections might be made by embedding the process feedback right in the studio period. The result might indicate whether teacher interaction were likely to be more effective during the working process

TABLE VI

Design for the Teaching Experiment
N=31

		A-1			A-2		
		B-1	B-2	B-3	B-1	B-2	B-3
C-1	D-1	N=1	N=1	N=2	N=1	N=1	N=2
	D-2	N=1	N=1	N=2	N=1	N=1	N=2
C-2	D-1	N=1	N=1	N=2	N=1	N=1	N=2
	D-2	N=1	N=1	N=1	N=1	N=1	N=2

Factor A-1	Delayed Process Feedback	N=15
Factor A-2	Immediate Process Feedback	N=16
Factor B-1	Interaction with Spontaneous Teachers	N= 8
Factor B-2	Interaction with Divergent Teachers	N= 8
Factor B-3	Independent Setting	N=15
Factor C-1	Spontaneous Students	N=16
Factor C-2	Divergent Students	N=15
Factor D-1	Sustaining Questions	N=16
Factor D-2	Entry Questions	N=15

rather than at some time after the product had been completed. It was further felt that this factor migh interact with teacher and student strategy factors.

2. Factor B dealt with the source of process feedback through the presence or absence of a "teacher" during the self-reflective phase of the experiment. B-1 condition meant that students interacted with teachers of spontaneous art strategy; B-2 meant that students interacted with teachers of divergent art strategy; and B-3 meant that students performed the evaluation exercise by themselves by means of an evaluation form instructing them in procedures to follow in writing out their responses (B-3 is referred to as independent setting).

There were 8 "teachers," 4 of whom worked in the divergent art strategy, 4 in the spontaneous art strategy. Each teacher worked with 2 students, one who worked in the divergent, one in the spontaneous strategy. This description is provided because this aspect of the design is not apparent from Table VI, page 52. Structurally, this arrangement largely ruled out specific teacher personality, but allowed for general personality differences to operate in a more controlled way.

Rationale: The presence or absence of the teacher and interactional contingencies during his presence remained issues after preliminary analyses of the major experiment. The effect of a teacher's presence during the self-reflective phase might be reinforced by the content and the placement of the process feedback. The pilot teaching experiment suggested, but not conciusively, that spontaneous students might gain more from immediate, intereactive feedback, while divergent students might gain from delayed, independent feedback.

3. Factor C was a classification factor, C-1 being students of the spontaneous strategy, C-2 of the divergent strategy. Students were assigned to one or the other group as a result of judgments made on the first 2 studio periods (before treatment took place). In this way, since 2 process series were taken each studio, 4 sequences were available for judgment. As earlier reported, Burkhart and the author agreed with 2 graduate research assistants in 29 out of 31 identifications. More than 31 students were originally involved, since the 8 who played the teacher's role were also judged. In addition there were "back up" teachers who observed (from an observation room) those selected as "first team" teachers. An effort was made to match teachers and students in the varying cells of the design for strategy complexity and aesthetic quality or art level. The stability achieved by having more pre treatment art work on which to base strategy identification is indicated by the fact that only 3 out of 31 students appeared to change their art strategies by the end of the experiment (or 90% stability).

Rationale: The rationale for this factor may be readily surmised by the nature of all of the factors in the teaching experiment. All factors are strategy linked, whether directly or indirectly. A persisting question in learning and in the study of creativity is whether a reinforcing (similar) or opposed influence is preferable, or the conditions under which each is helpful. One of the prime considerations in answering such questions has to do with the classification of students according to individual differences in learning strategies.

4. Factor D dealt with the teacher's primary focus during the evaluative session. Under D-1, teachers were trained to concentrate on sustaining questions, in which they tried to further the lead or base already set down by the student. Under D-2, teachers were trained to ask entry questions, in which they tried to bring in new ideas or ideas different from those advanced by the student.

Rationale: It was felt that this might be strategy linked, in that spontaneous teachers were expected to ask sustaining questions with more ease, in keeping with their "focus facilitation" power, whereas divergent teachers were expected to try to keep the evaluative goal as open as possible.

Summary of Factors for the Teaching Experiment Showing Their Predicted Strategy Linkage

	Spontaneous		Divergent
A-2	Immediate Process Feedback	A-1	Delayed Process Feedback
B-1	Interaction (Sp. Teachers) and	B-3	Independent Setting
B-2	Interaction (Dv. Teachers)		
C-1	Spontaneous Students	C-2	Divergent Students
D-1	Sustaining Questions	D-2	Entry Questions

In so linking the factors, a reinforcing viewpoint was taken, placing similar element with similar element and not with its opposite.

Dependent Variables

Only external or comparative judgments were performed on these data. Judging was done by a 4 man judge team, composed of 2 judges who worked in the spontaneous strategy and 2 in the divergent strategy. All 4 judges had previously been part of the 6 man team doing the comparative judgments for the major experiment. Works were coded by student, treatment group, and studio period and randomly mixed. There were 2 base studios and 3 treatment influenced studios, making a total of 155 panels (5 x 31), on each of which were at least 2 process sequences and 2 end products (at least 8 3-1/2" x 5" photos).

Three criteria were judged, one at a time, using the 9 point scale sorting method described earlier for the major experiment. Lower limit reliabilities may be estimated by means of the average judge to judge correlations. Upper limit reliabilities may be estimated by the average judge to total team correlations.

	Lower Limit	Upper Limit
Aesthetic Quality	.296	.636
Spontaneity	.645	.851
Divergency	.556	.814

These figures match fairly closely those reported for the major experiment, except that the aesthetic quality judgments are of lower reliability in the teaching experiment. As in the major experiment, spontaneous judges had consistently higher standard deviations than divergent judges. The intercorrelation of total team judgments on the 3 criteria for the teaching experiment was:

	Spontaneity	Divergency
Aesthetic Quality	.206	.330
Divergency	-.615	---

Unlike the major experiment, there was a greater contamination of aesthetic quality and divergency than vice versa. Also unlike the major experiment, spontaneous judges saw divergency and quality as related (.475), whereas divergent judges saw spontaneity and aesthetic quality as somewhat related (.298). This may explain the lower reliability for aesthetic quality (in fact, the 2 subteams correlated only .501 on aesthetic quality, as compared to .773 on spontaneity and .685 on divergency). This sample was seen as higher on spontaneity than divergency, whereas the total sample of the major experiment was seen as higher on divergency. Since the sample of the teaching experiment is made up of juniors, a comparison with the junior subsample of the major experiment confirms the fact that juniors have been judged consistently as higher in spontaneity than divergency. This may reflect the effect of cultural standards in the world of art. It is instructive to note the lingering effect of the "action" painters, despite the fact that "hard edge painting" is currently much in evidence.

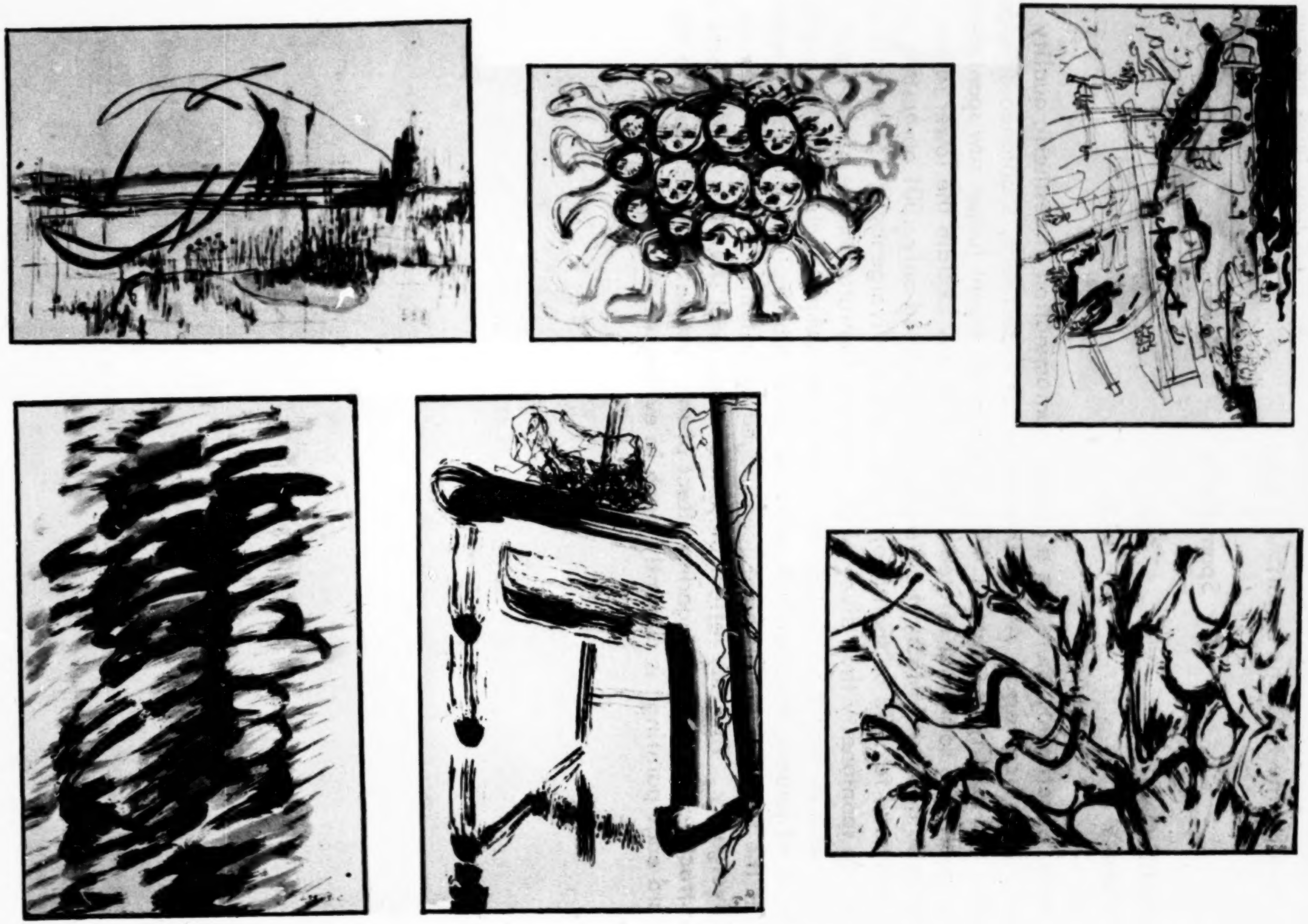


FIGURE 6

END PRODUCTS EXEMPLIFYING THE SPONTANEOUS STRATEGY

CHAPTER IV

ANALYSES OF THE DATA AND FINDINGS

I. Organization of the Analysis Chapter

The first section of this chapter will briefly discuss further analyses of the relations between the various dependent variables utilized in the major experiment. Following these structural considerations, the series of analyses of variance performed on the major experiment will be presented and followed with consideration of "dynamics of learning," or curves of change occurring under treatment and ascertainable from period to period comparisons. Then analyses of the teaching experiment will be given, also followed by considerations of dynamics or period to period analyses.

Many of the detailed or single analyses, as in the case of tables giving the results of judging, will be placed in appendices. Summary analyses of variance will be included in the main text.

II. Structure of the Dependent Variables

Differential Criteria Judgments

Table 37, Appendix A, page 139, shows how pre test differential global judgments as performed on Nitschke's (55) MPDE drawing sequences relate to the external or comparative judgments performed on the first studio processes and products for the junior sample (N=48). It is readily apparent that the formal and aesthetic judgments on the differential criteria relate most highly with the comparable criterion on the comparative judgment (.534 and .641). Spontaneity on the differential and on the comparative relate more lowly, but significantly (.320), while divergency on the differential does not relate to divergency on the comparative, although spontaneity on the differential relates negatively to divergency on the comparative (-.307). The global differential judgments are emphasized because they proved most sensitive in the analyses of variance to be reported later.

The significant relationships occur between differential and comparative judgments made on 2 quite differing kinds of art objects. The association is highest between the two aesthetic quality judgments and the formal and aesthetic quality judgments. These relationships are of all the more interest when it is recalled that aesthetic quality judgments had lowest judge reliabilities. The lower strategy judgments may be attributed to the lack of real process data on the MPDE on which differential judgments were based, since processes had to be inferred from one quick sketch to the next and not from one stage of a work to the next stage of that same work.

Art Strategy Criteria

In an attempt to further understand the 40 criteria presented in Tables II and III, pages 28 and 29, which were used for the internal judgments, they were correlated with each other, then submitted to a principal components factor analysis and a varimax rotation. Nine factors, 4 spontaneous and 4 divergent, with one split, appear to account for the dimensionality of these criteria. Table 48, Appendix E, page 175, shows the distribution of the 40 criteria, as indicated by the factor on which each has the highest loading.

It will be noted that there is one strong factor basically representing each strategy (F2 = spontaneity; F6 = divergency). What has been called Action and Spontaneous Medium Usage (F1 and F9), pull off as clear independent spontaneous factors, along with F7, which is represented by one criterion (erratic, wandering fine lines). There are likewise 3 relatively clear and independent divergent factors, one representing Surface Control, another Single Element emphasis, and another Progressive Control (F3, F4, and F8). One factor is mainly composed of the antithetical Compositional Structure achieved by the 2 strategies and is thus shared by both (F5).

In still another internal analysis of the 40 criteria, Table 49, Appendix E, page 176, shows those criteria in each strategy which clearly discriminate between the top and bottom half of the subjects in the major experiment, as ordered on each strategy domain. It will be noted, in passing, that the criteria so discriminating are usually significantly related to aesthetic quality (r of approximately .200 is significant for N=96). Only one criterion showed a reversal, and that was "erratic wandering fine lines," which is also negatively related to aesthetic quality and had previously come up as an independent dimension in the factor analysis.

In further effort to understand the strategies, an undergraduate senior, Nancy Stewart, working with the author under a Faculty Aide Scholarship, attempted a blind analysis of the written evaluation statements obtained from the freshman sample (N=48) of the major experiment. She methodically abstracted key phrases from the evaluation forms. Examples of these are given in Table 51, Appendix E, page 178. By utilizing these key statements, she was able to correctly identify 33 out of 38 cases where a clear imbalance of strategy criteria had been previously judged. Thus her blind analysis was 87 per cent successful and did not seem to reflect any effect of treatment cells (see Table 50, Appendix E, page 177, for these data).

Stewart[1] set out to determine whether art strategies could be determined from evaluation form contents and was successful in this, as reported above. As a second goal, she wished to determine whether anything in the written evaluations gave a clue as to the amount of learning to be expected. This latter task proved to be impossible to perform.

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[1] Research report presented to the author, summarizing her findings while working under a Faculty Aide Scholarship, Spring Term, 1963, Department of Art Education, The Pennsylvania State University.

In describing the attack on the first objective, Stewart gave general guidelines, as follows:

> The Divergent student often wrote of his work as, "changing from one viewpoint to another, but with the same subject matter," or, "seeing it as it builds," or "having fine detailed lines from the beginning." The Spontaneous student wrote of "using the whole space at once," "suggesting much with less, particularly less line," and "overlapping mass shapes." These statements correlate with the lists of Spontaneous and Divergent criteria (as given in Table II and III, pages 28 and 29). Personal ways of working (if they were explained in the writings), also led to determination of strategy. Those predicted as Spontaneous often wrote of "splashing ink on the page," or, "working faster and wetter," or, "loosening up, not concentrating on detail." The predicted Divergent papers included statements such as "I don't know where to stop adding detail," and, "keep adding until one sees something one likes." Expressions such as, "Be bolder, have more confidence," "Break rules," "Discipline yields freedom," and "Be more careful," show a marked personality difference in the papers.

Although the preceding is not a statistical analysis, it does help, perhaps, to bring content to the strategy criteria. As a further example of the coherence of the two strategies, the freshman sample was involved in a self-judgment of their own works from the four studio periods. Essentially they performed, though untrained, the same kind of internal judgment on their own complete works that the author and Burkhart applied to the entire sample of 96, with the following results:

		Internal (Strategy) Judgment	
		S	D
Freshman Self Judgment of Strategy	S	17	10
	D	3	18

Thus there was a 73 per cent agreement, with most of the errors occurring in the upper right cell, where considerably more students saw themselves as Spontaneous than the author and Burkhart.

Prediction of Internal Judgment Scores (Strategy Complexity) by Means of Expanded Predictor Battery

Using additional scales from the BBCI-X3, and including the SDT, Visual Magila (see Appendix B, page 145 to 155) and 2 new visual preference and performance measures (a Reversal Writing Task and a Dot Placement Task)[1], Burkhart demonstrated on the freshman sample (N=48) that it was possible to predict the "within strategy" (or greatest strategy) scores derived from the internal judgments as highly as .966 with 44 measures, at .959 with 33, .915 with 22, .749 with 11, and .616 with 6 measures. Tables 52 and 53, Appendix F, pages 183 and 184, present the data on prediction of internal judgments (strategy complexity), on the freshman sample, as analyzed by Burkhart.

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[1] Since these 2 measures were not given to the juniors, they do not appear in Appendix B. A description of them, therefore, is given here:

Reversal Rubato Test (12 scores)

This test is divided into 4 parts, 3 of which constitute actual reversal performance tasks: (1) printing a given paragraph backwards, (2) writing the same material backwards, (3) reversing the form (structure) of 12 given symbols defined by both connected and disconnected shapes. Each reversal task is timed for 2 minutes. The 12 scales fall under 3 factors: a reversal writing factor, a reversal printing factor, and a symbol reversal factor. The reversal printing scales have lead loadings on the factor on which measures of control are found. This is an important kind of measure for distinguishing the Divergent from the Spontaneous Strategy and has significance in relation to art gains criteria by defining the kinds of control and conceptual flexibility essential to Divergent work. As a total test, the Reversal Rubato is the strongest predictor of Within Strategy Art Judgments (Internal Judgments). As a new instrument, it needs further development and validation. (Developed by Melissa Winger)

The Dot Placement Test (8 scores)

Five rectangles (3 3/4" wide and 2 3/4" high) with a composition of 6 dots in each were presented to the subject. The subject added one dot within each of the 5 rectangles with instructions to improve the composition in each case. The test is scored by means of a transparent overlay grid, 3 horizontal rows high and 5 vertical columns wide, according to the row and column in which the subject placed the dot. This procedure was followed for the first 4 scores. For the fifth, a score was given if the dot was included within the boundary of the stimulus pattern. For the sixth, a score was given if the dot was included as a static element in the dot pattern in such a way as to increase the symmetry of the pattern by placement of the dot in a line between 2 other dots. The 8 scales fall into 2 factors, 1 showing relation to the expansion, the other to the contraction, of the given patterns by the placement of the dots. The test is a strong predictor of both strategy identification and internal art judgments and is useful in understanding the perceptual orientation of subjects working in the two strategies. As a new instrument it needs further development and validation. (Developed by Foster Marlow)

Note in these tables that measures much like those indicated as the dependent variables representing the capacity for creative action as used in the major experiment, and in fact including some of these, are most closely associated with the spontaneous strategy. More will be said about this later. In contrast, visual preferences and performance tasks requiring control appear to be strong predictors of the divergent strategy. (See Table 52, Appendix F, page 183.)

In one further analysis of strategy identification, Burkhart utilized the Multiple Discriminant Function technique to predict the strategy in which students made their complexity gains, as determined by the internal art judgments. For this purpose he used 7 measures: (1) SDT - Control (D); (2) SDT - Conventionality (D); (3) VM - Process Tentativeness, P+, F (S); (4) VM - Directness in Control, P-, M (D); (5) VM - Static Control, P-, F (D); (6) ISSD - Social Self-Determination (S); and (7) BBCI-X3 - Interest Motivation (S). (These tests are described in Appendix B.) Eighty-three per cent success was achieved by this method on the freshman sample:

		Internal Judgment Strategy Placement	
		S	D
Predicted Strategy	S	17	3
(Using Pre Test Scores)	D	5	23

For the difficulty involved, however, identification of art strategy by means of the art processes themselves seems to be both the most economical and the most accurate method, especially if sufficient samples are used, as in the teaching experiment. Such predictors as given above, however, help give content to the personality, preference, and performance characteristics of the two strategies.

Structure of the Combined Dependent Variables

Tables 54 and 55, Appendix G, page 187 and 188, give, separately, the internal intercorrelations of the art dependent variables and of the variables representing the capacity for creative action (at post test). Average pre-post correlation is .72 for the 13 measures in the 2 tables (there is no pre-post figure for the internal or strategy complexity scores, since they represent gains in themselves). Table VII, page 62, gives the intercorrelations of the art dependent variables with the variables representing the capacity for creative action (at post test). It is again evident that the dependent variables representing the capacity for creative action are significantly associated with spontaneity and negatively associated with divergency, in both external

TABLE VII

Intercorrelations of Art Dependent Variables and Variables
Representing the Capacity for Creative Action (at Post Test)
N=96

		Measures of the Capacity for Creative Action								
		Complexity	Aestheticism	Theory	Social Self-Determination	Originality	Creative Independence	Flexibility	Object Question	Average r
Art Judgments External	Aesthetic Quality	.294	.375	.289	.264	.119	.363	.184	.380	.284
	Spontaneity	.330	.230	.167	.201	.142	.309	.213	.280	.234
	Divergency	-.170	-.092	-.051	-.094	-.068	-.106	-.158	-.031	-.096
Art Judgments Internal	In Strategy	.175	.232	.281	.140	.133	.207	.030	.140	.167
	Spontaneity	.318	.318	.259	.316	.181	.369	.214	.196	.271
	Divergency	-.111	-.082	-.042	-.099	-.011	-.067	-.191	-.012	-.074
	Average r	.140	.164	.151	.122	.087	.180	.049	.159	.131

TABLE VIII

Varimax Rotation of Art Dependent Variables and Dependent Variables
Representing the Capacity for Creative Action (Pre and Post Combined)
N=96

		1. Flexibility	2. Strategy (Post)	3. Aesthetic Quality	4. Object Question	5. Aesthetic Attitude	6. Originality	7. Social Self-Determi-nation	8. Within Strategy	9. Strategy (Pre)	10. Theory	11. Communalities
1. Aesthetic Quality	(Pre)	.090	-.022	-.901*	.153	-.154	-.111	-.069	-.053	-.039	.170	.918
2.	(Post)	.144	-.157	-.756*	.221	-.188	-.084	-.144	-.375	.002	-.007	.869
3. Spontaneity	(Pre)	.171	-.302	-.594	.177	-.087	-.088	-.095	-.126	-.590*	.123	.908
4.	(Post)	.143	-.775*	-.404	.154	.031	.071	.099	-.128	-.274	-.015	.915
5. Divergency	(Pre)	-.047	.395	.029	-.072	.149	-.016	.012	-.062	.858*	.028	.928
6.	(Post)	-.098	.839*	-.029	.019	.006	-.002	.018	-.280	.254	-.010	.858
7. Within Strategy	(Intra)	.004	.047	-.242	.034	-.076	-.077	-.077	-.930*	-.002	.127	.960
8. Spontaneity	(Intra)	.023	-.843*	-.122	.087	-.131	-.079	-.213	-.301	-.036	.113	.908
9. Divergency	(Intra)	-.052	.748*	.086	.014	.084	.056	.057	-.590	.057	.003	.935
10. Complexity	(Pre)	.462	-.052	-.147	.062	-.177	-.097	-.576	.035	-.173	.346	.764
11.	(Post)	.522	-.108	-.104	.092	-.182	-.147	-.421	-.029	-.131	.557	.863
12. Aestheticism	(Pre)	.127	-.062	-.205	.046	-.876*	-.127	-.163	.028	-.130	.085	.899
13.	(Post)	.155	-.110	-.105	.128	-.857*	-.050	-.133	-.114	-.042	.277	.910
14. Theory	(Pre)	.247	.000	-.177	.203	-.155	-.350	-.199	-.075	.081	.664*	.773
15.	(Post)	.206	-.042	-.079	.053	-.294	-.346	-.127	-.142	.028	.752*	.862

TABLE VIII (continued)

		1. Flexibility	2. Strategy (Post)	3. Aesthetic Quality	4. Object Question	5. Aesthetic Attitude	6. Originality	7. Social Self-Determination	8. Within Strategy	9. Strategy (Pre)	10. Theory	11. Communalities
16. Social Self-Determination	(Pre)	.144	-.148	-.088	.094	-.068	-.287	-.777*	-.071	-.069	.047	.763
17.	(Post)	.183	-.095	-.064	-.016	-.154	-.119	-.856*	-.030	.076	.147	.846
18. Originality	(Pre)	.230	.066	-.152	.052	-.056	-.827*	-.145	-.042	-.068	.091	.806
19.	(Post)	-.006	-.103	-.012	-.062	-.015	-.850*	-.137	-.026	.065	.279	.839
20. Creative Independence	(Pre)	.538	.070	-.190	.104	-.216	-.516	-.323	-.003	-.031	.119	.773
21.	(Post)	.392	-.158	.018	.194	-.260	-.530	-.331	-.162	-.059	.208	.747
22. Flexibility	(Pre)	.871*	-.091	-.131	.072	-.147	-.132	-.106	-.045	-.103	.030	.854
23.	(Post)	.806*	-.130	-.045	.006	-.026	-.127	-.217	.066	.049	.303	.832
24. Object Question	(Pre)	-.010	-.058	-.162	.943*	-.061	-.040	-.080	-.004	-.064	.085	.941
25.	(Post)	.132	-.057	-.152	.935*	-.085	-.018	-.011	-.051	-.053	.068	.936

86.42% of variance accounted for

Significant factor intercorrelations:

$r_{1,8} = .422$

$r_{2,9} = .525$

$r_{3,9} = .402$

and internal judgments of strategy complexity. Less expected, these 8 measures relate even more significantly to aesthetic quality (which in this sample, is significantly related to both kinds of judgments of spontaneity).

Table VIII, pages 63 and 64, presents the results of a varimax rotation of a principal components factor analysis of combined dependent variables, 25 in all, including pre and post figures for 11 of the variables, plus the 3 internal art judgments. Ten factors were extracted, accounting for 86.42 per cent of the variance. Communalities run from a low of .747 to a high of .960 (the latter being the within strategy variable from the internal art judgments). Four of the factors (F2, F3, F8, and F9) are dominated by the art dependent variables, and the remaining 6 by separate variables from the 8 representing the capacity for creative action. Complexity (ISSD) and Creative Independence (BBCI-X3) split, the former between Flexibility (F1), Social Self-Determination (F7) and Theory (F10); the latter between Flexibility (F1) and Originality (F6). Two art strategy factors emerged, one for post strategy (F2) and one for pre (F9). The one other difference between the 2 strategy factors is that the pre strategy factor (F9) loads only on the external pre judgments, while the post strategy factor (F2) loads equally strongly on external post and on internal strategy judgments. As previously pointed out, the internal strategy judgments represent post status, or, more precisely, gains over period or studio one. Factor 8, for the within strategy score (dominant strategy score for each subject), obtained from the internal art judgments, and aesthetic quality (F3), both come up as strong factors and serve to demonstrate the independence of the key art dependent variables. In short, aesthetic quality (external), within strategy (internal), and the 2 strategies (external and internal) represent clearly different kinds of dependent variables. In like fashion, 6 out of the 8 variables for the capacity for creative action come up as clear factors, distinct from each other and without secondary loadings on the art dependent variables.

III. The Major Experiment: Art Dependent Variables

Procedure in Reporting Analyses

Although directional hypotheses might have been stated, it was felt to be wiser to interpret F ratios by means of probabilities for two-sided tests. Probabilities of .10 or less were accepted as significant.

In the text of this chapter will appear only summaries of analyses of variance. Analyses utilizing but one dependent variable at a time will appear in the appendices and present the actual sums of squares, mean squares, and F-ratios (where F exceeds unity).

Differential Art Criteria (Junior Sample Only)

Tables 56 through 58, pages 191 through 193, Appendix H, summarize analyses of variance performed on 13 separate differential criteria which were applied to the MPDE or DBS drawing sequences of the junior sample (N=48). There were 6 spontaneous criteria, 4 formal, and 3 divergent; and in addition totals of each of these domains and the results of 4 global judgments were analyzed.

No main effects occurred in the spontaneity domain, although for 3 criteria and the domain total there were significant A x B interactions. Examination of the means suggests that factor B (process vs. product feedback) is the stronger factor, but indicates that A-1 with B-1, and A-2 with B-2 are both strong combinations, far outweighing the A-2, B-1 and A-1, B-2 combinations.

In the formal domain, one significant main effect occurred on factor C for the criterion "progressive abstraction." It is an unambiguous main effect, there being no 2 or 3 way interactions. Those working under C-2, independent setting, score significantly above those working under C-1, interactive setting. It is likely that this effect is coming from divergent students, whose work appears to become progressively more abstract when they work on their own.

Several main effects occur within the divergent domain. On the criterion "rearrangement of objects," those working in the interactive setting, C-1, do significantly better than those working in the independent setting, C-2. There are no interactions observable. On the criterion "dominance-subordinance" there is a significant main effect favoring process feedback, B-1, over product feedback, B-2. There is also an A x B x C interaction on this criterion.

Table IX, page 68, gives a summary of the 3 factor analyses of variance for the "global" or "gestalt" differential judgments. It can be seen that there are strong main effects occurring on factors B and C. For aesthetic quality, there are main effects for both factors, with process feedback, B-1, superior to product feedback, B-2; and interactive setting, C-1, superior to independent setting, C-2. There are no significant interactions. For spontaneity, process feedback, B-1, is also superior to B-2, product feedback, and there are no interactions. In the divergent domain, interactive setting, C-1, is superior to independent setting, C-2, without interaction effects. In the formal domain global, however, though the same factors and the same directions come up as significant on main effects (B-1>B-2, C-1>C-2), there are heavy 2 way interactions.

It is important to notice that 6 out of 9 significant main effects fell on the global judgments (of which there were 4), while only 3 main effects fell on the separate differential criteria and domain totals (of which there were 16). Thus is demonstrated the increased sensitivity to treatment differences attributable to the global or gestalt kind of human judgment, a comparative judgment across many qualities. Perhaps this is because aesthetic phenomena are made up of physiognomic or tertiary qualities of a contextual nature (see Pratt, 58) and can only be adequately grasped as structural systems by a unified, not an analytical, act of perception. This in no way argues against the use of detailed differential criteria, but points to the fact that such criteria are molecular units about whose effective combinations we know next to nothing.

Expected Directions on Experimental Factors

Although, as mentioned before, two-sided tests of significance are applied in this report, there were expected directions to the treatment factors. In presenting the analyses, in brief, for the differential art criteria, above, it may have been noted that 4 out of 4 main effects on factor B showed B-1 superior to B-2, and 4 out of 5 main effects on factor C showed C-1 superior to C-2. On factors A, B, and C, the expected direction favors the first level, or A-1, B-1, C-1, over the second, or A-2, B-2, C-2. Of these 3 factors, C, dealing with interactive vs. independent setting was most in doubt. Prior studies reviewed in Chapter II had suggested the superiority of the internal locus of evaluation, of self-initiated activity in evaluation, and of process emphasis, recall, and feedback.

External or Comparative Art Dependent Variables

Tables 59 through 63, Appendix I, give the analysis of variance figures for each external art dependent variable, one at a time. These tables should be consulted, therefore, for the details on which summary tables are based. Table 59 of Appendix I, page 197 differs from the remainder in that it is a 3 factor rather than 4 factor analysis. There is no significant disproportionality in the 3 factor case, so that no reduction factor is applied to the sums of squares, as in the 4 factor analyses (where a .9352 reduction factor is used to adjust the sums of squares). It will be seen, by comparing Table 59 and Table 61, that similar results are obtained in the 3 and 4 factor analyses for the aesthetic quality criterion.

Table X, page 69, summarizes the analyses of variance for 4 external or comparative art dependent variables. The fourth listed variable, greatest strategy gain, was obtained by putting together the highest strategy score for each person and ignoring the strategy name. This would be equivalent to a "movement" or "complexity" score without regard to what kind of movement or complexity.

Table X shows one significant main effect for aesthetic quality on factor B, in the expected direction, favoring process feedback, B-1, over product feedback, B-2. There are no interactions. For spontaneity, there is a significant main effect, showing that divergent students, D-2, gain significantly over spontaneous students, D-1. For divergency the opposite is true, the spontaneous students (D-1) gaining significantly over the divergent (D-2). On spontaneity, there are 3 and 4 way interactions among the factors, suggesting that gains on spontaneity by and large are different for the various levels of factors A, B, and C. A comparison of treatment groups and

TABLE IX

Summary of Analyses of Variance[1]
Gains on Differential Art Judgments on the Multiple Purpose Drawing Exercise: Gestalt or Global Judgment
Junior Sample, N=48

Source of Variation[2]	Direction	Aesthetic Quality F-Ratio	Aesthetic Quality Probability	Spontaneity F-Ratio	Spontaneity Probability	Formal F-Ratio	Formal Probability	Divergency F-Ratio	Divergency Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	B-1>B-2	2.871	.10	5.379	.05	15.198	.005	-----	----
C	C-1>C-2	10.540	.005	-----	----	3.117	.10	-----	----
AB	------	-----	----	-----	----	4.374	.05	-----	----
AC	------	-----	----	-----	----	7.845	.01	-----	----
BC	------	-----	----	-----	----	11.014	.005	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] For names of factors A, B, and C consult Table V, p. 43.

TABLE X

Summary of Analyses of Variance[1]
Art Dependent Variables: External or Comparative Judgments
N=96

Source of Variation[2]	Direction	Aesthetic Quality F-Ratio	Aesthetic Quality Probability	Spontaneity F-Ratio	Spontaneity Probability	Divergency F-Ratio	Divergency Probability	Greatest Strategy Gain F-Ratio	Greatest Strategy Gain Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	B-1>B-2	5.181	.05	-----	----	-----	----	-----	----
C	------	-----	----	-----	----	-----	----	-----	----
D	D-1>D-2	-----	----	-----	----	7.477	.01	-----	----
D	D-2>D-1	-----	----	10.550	.005	-----	----	-----	----
AB	------	-----	----	-----	----	-----	----	-----	----
AC	------	-----	----	-----	----	-----	----	-----	----
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	-----	----	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----
ABD	------	-----	----	7.640	.01	4.970	.05	-----	----
ACD	------	-----	----	-----	----	3.368	.10	-----	----
BCD	------	-----	----	-----	----	-----	----	-----	----
ABCD	------	-----	----	4.585	.05	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

subgroups on the art dependent variables, as found in Table XI, pages 71 and 72, indicates that expected directions of factors A, B, and C appear for the spontaneity analysis but not for that of divergency.

It was not expected that students classified in one strategy before treatment would show gains in the opposite afterwards. As will be shown later, a different finding results from analyses of the internal art dependent variables. Table XI indicates that, on external judgments, spontaneous students are still significantly more spontaneous than divergent at the end of the experiment, but shows that they have lost in spontaneity and gained in divergency. Conversely, divergent students remain much more divergent than spontaneous, but show their greater gain in spontaneity.

Internal or Intra-Individual (Strategy Complexity) Art Dependent Variables

Tables 64 through 68, Appendix J, pages 205 through 209, give analysis of variance figures for each internal art dependent variable, one at a time. These tables should be consulted for sums of squares, mean squares, and F ratios (computed when equal to unity or greater).

Table XII, page 74, summarizes the results of analyses of variance for the internal or intra-individual (strategy complexity) judgments. It will be noted that, through 2 scores were directly obtainable from applying the 40 art strategy complexity criteria, 5 dependent variables appear in Table XII. This is because various meaningful combinations (or separations) of these 2 basic strategy gain indicators were possible. By far the most meaningful, and apparently the most sensitive reflection of treatment effects, is what has been called the "within strategy" variable. This has been previously discussed. Briefly, it represents the criteria total scored upon in the subject's dominant strategy. Perhaps a brief example of these 5 kinds of scores is in order (using imaginary data for 5 subjects):

	Spontaneous Total	Divergent Total	Within Strategy	Combined Strategies	Opposite Strategy
Subject 1	14	6	14	20	6
Subject 2	2	10	10	12	2
Subject 3	9	6	9	15	6
Subject 4	5	16	16	21	5
Subject 5	0	15	15	15	0

Basic scores, judged directly

Permutations of basic scores

Table XII shows 3 significant main effects for the within strategy variable. Condition A-1, self-discovered criteria, is seen as superior to A-2, externally given criteria; and process feedback, B-1, as superior to product feedback, B-2. At the .10 level, spontaneous students, D-1, make greater gains in complexity within their

TABLE XI

Means and Standard Deviations for Various Experimental Groups and Subgroups on Art Dependent Variables

Group	N		Aesthetic Quality		Spontaneity		Divergency		Within Strategy (Intra)	Spontaneity (Intra)	Divergency (Intra)
			Pre	Post	Pre	Post	Pre	Post			
TOTAL	96	M.	26.26	27.33	26.35	26.71	29.00	31.85	12.39	7.65	8.45
		S. D.	9.28	9.45	12.29	10.92	9.36	9.68	4.42	5.32	5.89
JUNIORS	48	M.	30.31	31.33	33.25	31.17	25.98	30.04	13.04	8.50	8.40
		S.D.	8.66	9.42	11.37	11.57	9.53	11.36	4.23	5.32	6.27
FRESHMEN	48	M.	22.21	23.33	19.46	21.38	32.02	33.67	11.73	6.79	8.50
		S.D.	8.10	7.70	8.88	7.64	8.23	7.32	4.56	5.24	5.55
Self-Discovery (A-1)	46	M.	26.46	28.46	25.57	25.89	29.76	32.67	13.57	7.91	9.20
		S.D.	9.64	9.50	12.57	11.32	10.49	10.22	4.02	5.63	6.35
External Criteria (A-2)	50	M.	26.08	26.30	27.08	26.62	28.30	31.10	11.30	7.40	7.76
		S.D.	9.04	9.39	12.10	10.63	8.23	9.19	4.53	5.06	5.40
Process Feedback (B-1)	50	M.	26.42	28.90	26.32	27.10	29.38	31.32	13.36	7.96	9.46
		S.D.	10.17	9.40	12.66	11.04	9.75	9.96	4.17	5.59	5.90
Product Feedback (B-2)	46	M.	26.09	25.63	26.39	25.37	28.59	32.43	11.33	7.30	7.35
		S.D.	8.32	9.32	12.00	10.83	9.01	9.43	4.49	5.05	5.74
Interactive Setting (C-1)	44	M.	27.02	28.34	24.77	26.21	31.98	32.80	12.48	7.80	8.75
		S.D.	9.92	8.69	9.65	9.71	9.20	9.66	4.37	5.51	5.56
Independent Setting (C-2)	52	M.	25.62	26.48	27.69	26.33	26.48	31.06	12.31	7.52	8.19
		S.D.	8.75	10.06	14.10	11.94	8.82	9.72	4.51	5.20	6.19
Spontaneous Students	43	M.	30.28	32.02	36.88	33.47	21.79	27.77	13.23	10.05	6.98
		S.D.	8.86	8.75	8.30	10.45	6.35	9.36	4.26	5.57	5.86
Divergent Students	53	M.	23.00	23.53	17.81	20.43	34.85	35.17	11.70	5.70	9.64
		S.D.	8.36	8.28	7.35	7.22	7.05	8.68	4.47	4.25	5.69

TABLE XI (continued)

Group	N		Aesthetic Quality		Spontaneity		Divergency		Within Strategy (Intra)	Spontaneity (Intra)	Divergency (Intra)
			Pre	Post	Pre	Post	Pre	Post			
Group A-1, B-1, C-1	12	M.	27.92	30.83	22.08	27.58	35.75	31.83	13.50	8.67	9.08
		S.D.	11.03	9.02	12.67	10.31	10.25	10.17	4.06	6.01	5.58
Group A-1, B-1, C-2	13	M.	24.54	28.23	28.46	26.23	25.62	31.39	14.46	7.62	10.23
		S.D.	8.78	9.58	14.50	11.67	9.93	10.87	4.47	5.61	7.49
Group A-1, B-2, C-1	10	M.	27.30	28.20	22.20	20.50	34.10	38.60	13.00	6.40	10.80
		S.D.	11.60	9.25	9.25	8.40	8.95	6.19	4.32	4.84	5.60
Group A-1, B-2, C-2	11	M.	26.36	26.36	29.00	28.55	24.18	29.73	13.09	8.82	6.34
		S.D.	7.92	10.85	12.45	13.89	8.42	11.51	3.51	6.35	6.02
Group A-2, B-1, C-1	11	M.	25.64	29.36	26.91	28.09	27.18	29.91	12.27	8.00	9.00
		S.D.	10.73	8.42	7.41	9.13	7.52	9.80	4.20	5.76	4.75
Group A-2, B-1, C-2	14	M.	27.50	27.50	27.50	26.71	29.14	31.93	13.07	7.64	9.43
		S.D.	10.94	10.90	14.47	13.33	8.90	10.07	4.16	5.67	5.91
Group A-2, B-2, C-1	11	M.	27.18	24.73	27.91	28.00	30.73	31.46	11.09	7.91	6.27
		S.D.	7.08	8.04	7.78	9.97	8.44	10.54	5.09	5.82	5.71
Group A-2, B-2, C-2	14	M.	24.14	23.93	26.14	24.29	26.43	30.93	8.93	6.29	6.29
		S.D.	7.33	9.58	15.88	9.92	8.21	7.46	4.05	3.32	4.92

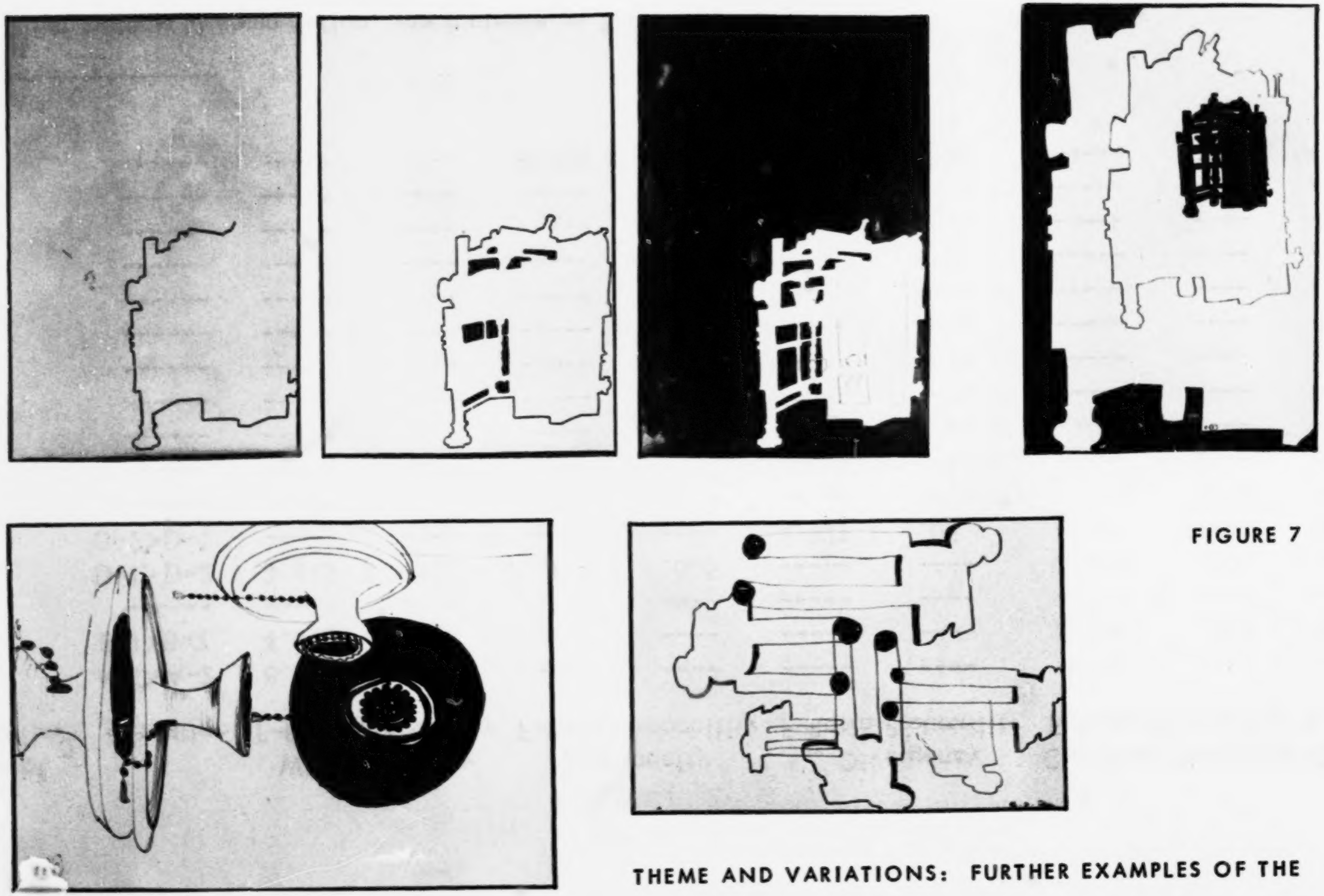

FIGURE 7

THEME AND VARIATIONS: FURTHER EXAMPLES OF THE DIVERGENT STRATEGY

TABLE XII

Summary of Analyses of Variance[1]
Art Dependent Variables: Internal or Intra Judgments
N=96

Source of Variation[2]	Direction	Within Strategy		Spontaneity		Divergency		Combined Strategies		Opposite Strategy	
		F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability
A	A-1>A-2	6.093	.025	-----	----	-----	----	-----	----	-----	----
B	B-1>B-2	4.942	.05	-----	----	-----	----	5.764	.025	-----	----
C	------	-----	----	-----	----	-----	----	-----	----	-----	----
D	D-1>D-2	3.613	.10	21.475	.005	-----	----	3.010	.10	-----	----
D	D-2>D-1	-----	----	-----	----	4.931	.05	-----	----	-----	----
AB	------	-----	----	-----	----	-----	----	-----	----	-----	----
AC	------	-----	----	-----	----	-----	----	-----	----	-----	----
AD	------	-----	----	-----	----	-----	----	-----	----	-----	----
BC	------	-----	----	-----	----	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----	-----	----
ABD	------	-----	----	-----	----	3.199	.10	-----	----	-----	----
ACD	------	-----	----	-----	----	-----	----	-----	----	-----	----
BCD	------	-----	----	-----	----	-----	----	-----	----	-----	----
ABCD	------	-----	----	8.870	.005	5.90	.025	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

strategies than do divergent students, D-2. There are no interactions, and findings on factors A and B are in the expected directions. Thus it appears that the superiority of self-discovered criteria is not dependent upon the type of feedback (factor B) or whether there is an interactive or independent setting for evaluation (factor C). In like manner, the superiority of process feedback is not dependent on the locus or content of evaluation (factor A) or whether there is an interactive or independent setting (factor C). Spontaneous students generally exhibit greater complexity of strategy gains and these gains are not dependent on levels of the other 3 factors.

Looking at spontaneity alone as a dependent variable, Table XII indicates a highly significant F ratio for factor D, in which spontaneous students (as judged or identified by studio one comparative or external judgments), D-1, gain over divergent students, D-2. The converse is true on the divergency variable, where divergent students, D-2, make the greater gain. An examination of means in Table XI, pages 71 and 72, shows that both variables, spontaneity and divergency, respond in the expected direction to factors A, B, and C, but never significantly, or not with greatly different means. Examination of the means for 3 and 4 factor interactions (the latter, or 4 factor, level not obtainable from Table XI, which gives only A x B x C subgroups), does not yield a clear explanation of the A x B x C x D interaction on spontaneity or the A x B x D and A x B x C x D interactions on divergency. The only safe generalization is that the main effects on factor D, showing spontaneous students gaining in spontaneity and divergent students gaining in divergency, are not independent of the combinations of levels of factors A, B, and C, even though both dependent variables show means which pull in the expected directions on factors A, B, and C.

The issue now arises as to why students classified in exactly the same way should show opposed gains when the results of the external and internal strategy gains are compared (consult Table X, page 69, and Table XII, page 74, and Table XI, pages 71 and 72). A comparison of mean gains will bring the issue to a focus.

	External Judgments[1]						Internal Judgments[2]	
	Spontaneity			Divergency				
	Pre	Post	Gain	Pre	Post	Gain	Spontaneity	Divergency
Spontaneous Students	6.15	5.58	-.57	3.63	4.63	1.00	10.05	6.98
Divergent Students	2.97	3.40	.43	5.81	5.86	.05	5.70	9.64

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[1] In terms of a 9 point scale.

[2] Prorated as comparable 21 point scales (these constitute gain scores in themselves).

Table XIII, page 77, may offer still further clarification, illustrating as it does strategy mobility, or change, from beginning classification, and the strategy in which various groups of students made their greater gains on the external or comparative judgments. Twenty-six per cent of the total sample shift in strategy between the beginning and end of the experiment. This in itself accounts for a great amount of the gains shown by the classified students in the opposite strategy. Even more telling, however, is the fact that of those not changing strategy classification, 50 per cent, none the less, gain more in the opposite strategy. Thus, simply and clearly, 60 per cent of the total students gain in the opposite strategy on the comparative judgment, even though 74 per cent retain their original strategy classification.

On the internal judgments, however, 30 students show greater gains (and therefore final strategy classification) in a strategy other than the one in which they were placed by the comparative or external judgment applied to period one art works. Thus 69 per cent do not change on the internal judgment, as compared to 74 per cent on the external (a difference of 5 out of 96 cases). But the comparison to be made to clarify the issue of the opposed strategy gains on the 2 different analyses of variance is that while 60% show gains in the opposite strategy on the external criteria (though less shift), only 31% can show gains in the opposite strategy on the internal criteria. (Figures 8, 9, and 10 give pictorial examples of the works of students who show a transition from one strategy to another over the 4 studio periods, see pages 79, 87, and 89.)

This flip-over occurring from the differing perspective of the 2 kinds of judgments perplexed the author for some time. Examination of examples bore out the above analysis, however, by demonstrating that 69 per cent of the students could indeed gain in strategy complexity on the internal judgment and yet 60 per cent of the students could exhibit more of the opposite strategy on a comparative judgment.

In addition the way in which the art strategy criteria are applied to the works of one student at a time and the very nature of the criteria (for example, S16 is "central emphasis," while D4 is "off center composition") tends to depress one score at the expense of the other. That this is not completely so, however, is shown by the ratio of spontaneous gains to divergent gains by spontaneous students, 1.4 to 1.0, and by that of divergent gains to spontaneous gains by divergent students, 1.7 to 1.0. That high scores do not crowd out scores on the opposite strategy is indicated by a .906 correlation between within strategy and combined strategy gains. Additional proof of this fact comes from the -.499 relationship between the 2 strategies for the internal judgments as opposed to a -.708 for the external judgment (post test correlations).

Returning to Table XII, page 74, the results of using the combined strategy scores as a dependent variable are shown. A significant effect is seen on factor B, in the expected direction, with B-1, process feedback, superior to B-2, product feedback. On factor D, spontaneous students, D-1, make the greater gains. Factors A and C

TABLE XIII

External or Comparative Art Judgments: Strategy Mobility and Strategy in which Students Made Their Greatest Gains

N=96

		S→S	D→D	S→D	D→S
S-Gains	JR	12	6	0	4
	FR	2	18	0	4
D-Gains	JR	9	7	10	0
	FR	3	14	7	0
		26	45	17	8

Note: 26% change strategy, 74% do not
46% of those beginning and ending S gain in D more
53% of those beginning and ending D gain in S more
Or, 50% of those not shifting strategy gain more in the opposite strategy

Legend:	
S→S	Student begins S and stays S
D→D	Student begins D and stays D
S→D	Student begins S and becomes D
D→S	Student begins D and becomes S
S-Gains	Student gains more in S than D
D-Gains	Student gains more in D than S

reveal means in the expected direction also, but differences are not significant. There were no significant 2, 3, or 4 way interactions appearing on this variable.

The opposite strategy variable does not yield any significant main or simple effects, nor were there any significant interactions. An examination of means shows B-1, C-1, and D-1 superior to their counterparts, but not significantly; while a slight reversal is noted on factor A, A-2 being superior to A-1, but not significantly.

Summary of Analyses of Art Dependent Variables

Looking across differential, external, and internal art judgments as these were utilized in analyses of variance, one obtains a total of 17 per cent significant main effects. Of the significant F ratios falling on factors A, B, and C, where there are expected directions (but 2 sided tests of significance), factor B is by far the most influential independent variable affecting art. Seven significant F ratios are shown in the tables, and all favor process feedback, B-1, over product feedback, B-2. Three of these 7 significant F ratios appear on combined external and internal analyses, out of 9 possible chances.

The second strongest independent variable appears to be factor C, but all of the findings occur on the differential criteria, which were analyzed for the junior sample only. There 4 significant F ratios favor C-1, interactive setting, over independent setting, C-2. Three of these main effects are on the global or gestalt differential judgments. There was one reversal, on the differential criterion progressive abstraction, which favored C-2, independent setting.

Looking at the analyses for the total sample, one sees that there are no main effects on factor C, but there is one strong one for factor A, favoring self-discovered criteria, A-1, over external criteria, A-2. It can also be seen that the internal art judgments are very sensitive as dependent variables, with 7 out of 20 possible main effects significant.

In terms of the strategy classification factor, analysis showed that while students remained in the strategy indicated by their beginning works in 74 per cent of the cases for external judgments and 69 per cent for internal, yet the 2 kinds of judgments gave opposed images of who was gaining or becoming more complex in the strategies. It was pointed out that even though 74 per cent remained in their beginning strategy for the external judgments, by that comparative point of view gains for 60 per cent of the total sample fell in the strategy opposite to the one in which they were classified at the start of the experiment. From the perspective of the internal or intra-individual judgment, however, 69 per cent gained in the strategies in which they were classed. Spontaneous students appeared to show generally greater mobility, gaining significantly over divergent students on the within strategy, and combined strategy dependent variables on the internal judgments.

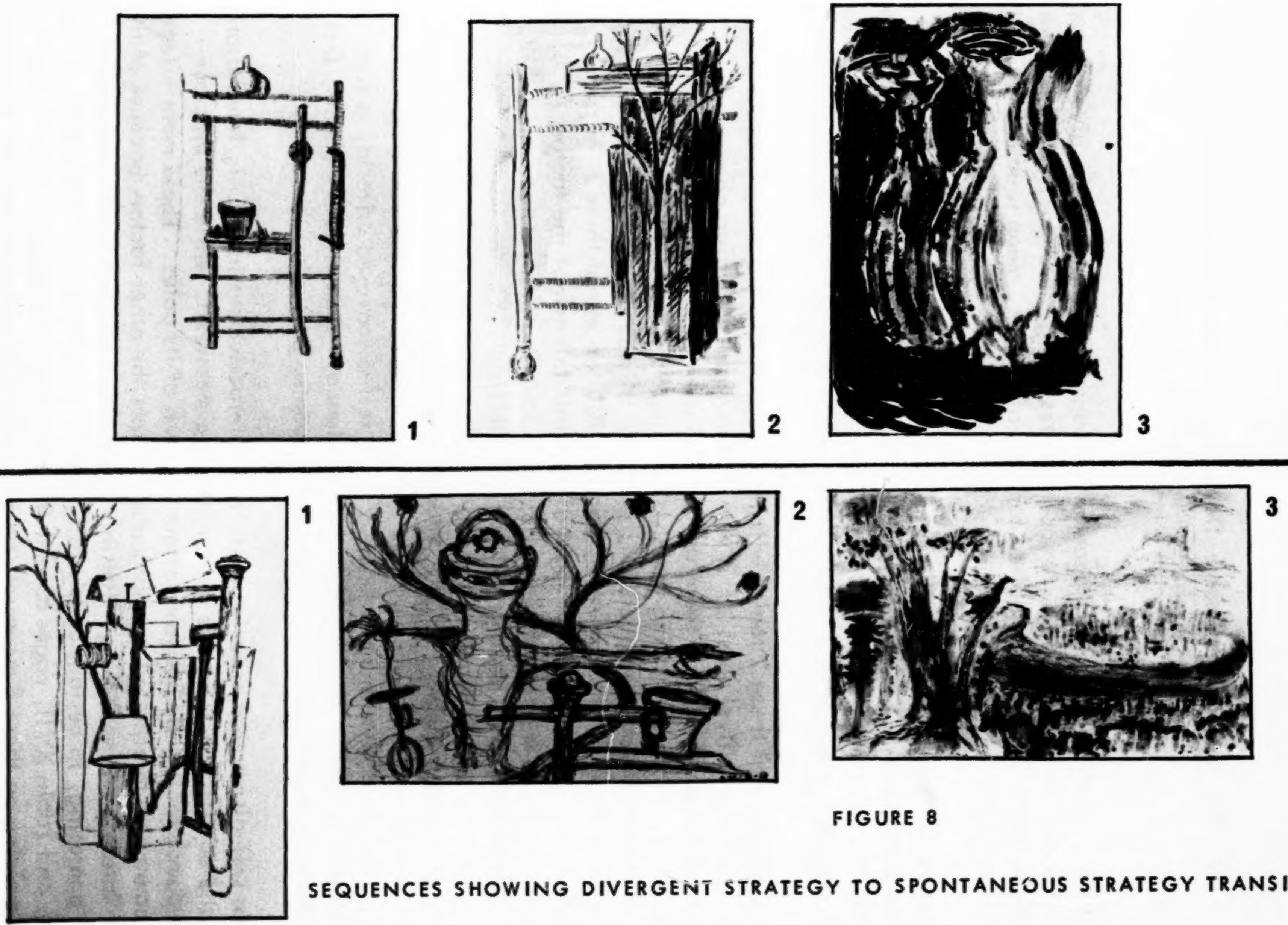

FIGURE 8

SEQUENCES SHOWING DIVERGENT STRATEGY TO SPONTANEOUS STRATEGY TRANSITIONS

On 3 strategy complexity dependent variables, some 3 and 4 way interactions occurred. On the key art dependent variables, aesthetic quality (external), and within strategy complexity (internal), 6 out of 8 possible main effects were significant, and there were no interactions.

IV. The Major Experiment: Dependent Variables Representing the Capacity for Creative Action

Tables 69 through 76, Appendix K, pages 213 through 220, give analysis of variance figures for each of the 8 variables representing the capacity for creative action. These tables should be consulted for sums of squares, mean squares, and F ratios (computed when equal to unity or greater).

Table XIV, page 81, summarizes the results of analyses of variance for the first 4 of the 8 variables representing the capacity for creative action (from the ISSD-63 test, referred to herein as Set I of the variables of the capacity for creative action). Table XV, page 82, presents results for Set II, or the second 4, of these 8 variables.

A comparison of these 2 tables will reveal that there are many interactions occurring. There are five cases of 2 way interactions occurring on these 8 dependent variables; and there are seven 3 way interactions (always with factor D present). Notwithstanding these 12 interactions and the attendant difficulty of interpretation they occasion, it should still be pointed out that 6 significant main effects occur for factors A, B, and C. All but one of these is in the expected direction. Two significant main effects fall to each of the factors A, B, and C. On factor B, there is one unexpected F ratio, favoring product feedback, B-2, over process feedback, B-1, on the variable "flexibility". On the variable "social self-determination," B-1 is superior to B-2. On that same variable, C-1, interactive setting, is significantly superior to C-2, independent setting. This same effect and direction is strongly noted for the variable "aestheticism." For the variables "originality" and "creative independence," A-1, self-discovered criteria, is superior to A-2, external criteria. On "creative independence," spontaneous students, D-1, make significantly higher gains than divergent students, D-2.

Thus self-discovered criteria, A-1, and interactive setting, C-1, have strong effects on the capacity for creative action, as here measured, while the process-product feedback factor, B, has some effect on each of its poles. These main effects, however, cannot be interpreted unambiguously across the other factors because of the number of interactions appearing. Possibly regression effects as well as treatment effects are operating, in certain cases, although an examination of Table XVI, pages 83 and 84, and Table XVII, pages 85 and 86, shows both spontaneous and divergent students as gaining on these 8 measures, on the whole, despite the fact that spontaneous students are, without exception, always higher than divergent students, at both pre and post test. Pre and post correlations of these 8 measures (shown in Table 55,

TABLE XIV

Summary of Analyses of Variance[1]
Dependent Variables Representing the Capacity for Creative Action: Set I (ISSD)
N=96

		Complexity		Aestheticism		Theory		Social Self-Determination	
Source of Variation[2]	Direction	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	B-1>B-2	-----	----	-----	----	-----	----	2.789	.10
C	------	-----	----	6.735	.025	-----	----	4.218	.05
D	------	-----	----	-----	----	-----	----	-----	----
AB	------	-----	----	-----	----	-----	----	-----	----
AC	------	-----	----	-----	-----	7.491	.01	3.087	.10
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	-----	----	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----
ABD	------	-----	----	3.781	.10	-----	----	-----	----
ACD	------	6.412	.025	-----	----	-----	----	3.115	.10
BCD	------	-----	----	-----	----	-----	----	-----	----
ABCD	------	-----	----	-----	----	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE XV

Summary of Analyses of Variance[1]
Dependent Variables Representing the Capacity for Creative Action: Set II
N=96

Source of Variation[2]	Direction	Originality F-Ratio	Originality Probability	Creative Independence F-Ratio	Creative Independence Probability	Flexibility F-Ratio	Flexibility Probability	Object Question F-Ratio	Object Question Probability
A	A-1>A-2	3.359	.10	3.194	.10	-----	----	-----	----
B	B-2>B-1	-----	----	-----	----	4.335	.05	-----	----
C	------	-----	----	-----	----	-----	----	-----	----
D	D-1>D-2	-----	----	4.759	----	-----	----	-----	----
AB	------	-----	----	-----	----	-----	----	-----	----
AC	------	-----	----	-----	----	-----	----	7.111	.01
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	6.978	.01	-----	----	-----	----	-----	----
BD	------	3.266	.10	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----
ABD	------	7.072	.01	-----	----	-----	----	-----	----
ACD	------	8.232	.01	5.156	.05	-----	----	3.788	.10
BCD	------	-----	----	-----	----	-----	----	-----	----
ABCD	------	-----	----	-----	----	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE XVI

Means and Standard Deviations for Various Experimental Groups and Subgroups on Dependent Variables Representing the Capacity for Creative Action (Set I, ISSD)

Group	N		Complexity		Aestheticism		Social Self-Determination		Theory	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
TOTAL	96	M.	7.03	7.08	11.13	11.56	7.78	7.96	9.10	9.18
		S.D.	2.23	2.53	3.18	3.45	2.29	2.22	2.31	2.56
JUNIORS	48	M.	8.00	7.88	12.15	12.48	8.63	8.50	9.77	9.40
		S.D.	1.68	2.14	2.76	3.10	1.82	1.91	2.36	2.15
FRESHMEN	48	M.	6.06	6.29	10.10	10.65	6.94	7.42	8.44	8.96
		S.D.	2.30	2.66	3.26	3.58	2.41	2.40	2.07	2.92
Self-Discovery (A-1)	46	M.	7.35	7.24	11.04	11.57	8.00	8.22	9.30	9.72
		S.D.	2.27	2.68	3.29	3.42	2.37	2.33	2.67	2.77
External Criteria (A-2)	50	M.	6.74	6.94	11.20	11.56	7.58	7.72	8.92	8.68
		S.D.	2.17	2.40	3.10	3.52	2.21	2.12	1.94	2.26
Process Feedback (B-1)	50	M.	7.32	7.34	10.98	11.76	7.78	7.96	9.14	9.56
		S.D.	2.25	2.67	3.27	3.63	2.19	2.24	2.42	2.98
Product Feedback (B-2)	46	M.	6.72	6.80	11.28	11.35	7.78	7.96	9.07	8.76
		S.D.	2.19	2.36	3.10	3.28	2.41	2.23	2.22	1.96
Interactive Setting (C-1)	44	M.	7.14	7.11	10.61	11.68	7.71	8.07	9.05	9.57
		S.D.	2.12	2.32	2.91	3.23	2.28	2.24	2.15	2.61
Independent Setting (C-2)	52	M.	6.94	7.06	11.56	11.46	7.85	7.87	9.15	8.85
		S.D.	2.33	2.72	3.35	3.66	2.30	2.23	2.46	2.49
Spontaneous Students	43	M.	7.47	7.70	12.21	12.65	8.19	8.23	9.51	9.40
		S.D.	2.32	2.69	2.96	2.84	2.23	2.07	2.37	2.58
Divergent Students	53	M.	6.68	6.59	10.25	10.68	7.45	7.74	8.77	9.00
		S.D.	2.10	2.30	3.10	3.67	2.30	2.34	2.22	4.47

TABLE XVI (continued)

Group	N		Complexity		Aestheticism		Social Self-Determination		Theory	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
Group A-1, B-1, C-1	12	M.	7.67	7.17	10.58	11.75	8.42	8.25	9.17	10.67
		S.D.	2.15	2.44	3.15	3.57	1.44	2.26	2.69	3.28
Group A-1, B-1, C-2	13	M.	8.15	8.39	12.00	12.39	7.62	8.23	9.85	10.23
		S.D.	2.58	3.20	3.63	3.71	2.66	2.59	2.88	2.89
Group A-1, B-2, C-1	10	M.	7.40	7.30	9.90	11.00	8.40	8.30	8.80	9.70
		S.D.	1.17	1.83	2.51	2.45	2.84	2.71	1.69	2.00
Group A-1, B-2, C-2	11	M.	6.00	5.91	11.46	10.91	7.64	8.09	9.27	8.09
		S.D.	2.45	2.59	3.67	3.86	2.54	2.02	3.29	2.17
Group A-2, B-1, C-1	11	M.	6.91	7.36	10.55	12.00	7.00	7.91	9.27	9.27
		S.D.	2.34	2.38	2.98	3.32	2.15	1.81	2.10	2.45
Group A-2, B-1, C-2	14	M.	6.57	6.50	10.71	11.00	8.00	7.50	8.36	8.21
		S.D.	1.79	2.47	3.41	4.08	2.29	2.35	1.91	2.89
Group A-2, B-2, C-1	11	M.	6.55	6.64	11.36	11.91	7.00	7.82	8.91	8.55
		S.D.	2.58	2.73	3.14	3.73	2.49	2.40	2.17	2.25
Group A-2, B-2, C-2	14	M.	6.93	7.29	12.07	11.50	8.07	7.71	9.21	8.79
		S.D.	2.24	2.23	2.95	3.23	1.98	2.09	1.72	1.37

TABLE XVII

Means and Standard Deviations for Various Experimental Groups
and Subgroups on Dependent Variables Representing
the Capacity for Creative Action (Set II)

Group	N		Originality Pre	Originality Post	Creative Independence Pre	Creative Independence Post	Flexibility Pre	Flexibility Post	Object Question Pre	Object Question Post
TOTAL	96	M.	5.74	6.06	16.48	17.91	21.73	22.78	3.44	3.74
		S.D.	2.18	1.94	6.03	6.24	5.33	5.46	5.16	4.76
JUNIORS	48	M.	6.17	6.25	18.21	19.71	23.65	23.90	6.48	6.50
		S.D.	2.12	1.87	5.45	5.56	5.00	4.73	5.86	5.21
FRESHMEN	48	M.	5.31	5.88	14.75	16.10	19.81	21.67	.40	.98
		S.D.	2.18	2.00	6.14	6.41	5.00	5.94	.82	1.74
Self-Discovery (A-1)	46	M.	5.46	6.13	16.63	18.89	21.59	23.13	3.02	3.52
		S.D.	2.15	2.04	5.98	7.11	5.89	6.08	4.78	4.20
External Criteria (A-2)	50	M.	6.00	6.00	16.34	17.00	21.86	22.46	3.82	3.94
		S.D	2.20	1.85	6.13	5.22	4.82	4.86	5.51	5.25
Process Feedback (B-1)	50	M.	5.72	6.06	16.56	18.30	23.10	23.46	3.32	3.58
		S.D.	2.21	1.99	5.97	6.91	5.51	5.52	4.46	4.39
Product Feedback (B-2)	46	M.	5.76	6.06	16.39	17.48	20.24	22.04	3.57	3.91
		S.D.	2.16	1.89	6.16	5.46	4.76	5.35	5.88	5.16
Interactive Setting (C-1)	44	M.	5.75	6.21	16.16	17.82	21.46	22.80	3.80	3.84
		S.D.	2.30	1.95	6.81	6.30	4.72	5.61	5.43	4.90
Independent Setting (C-2)	52	M.	5.73	5.94	16.75	17.98	21.96	22.77	3.14	3.65
		S.D.	2.09	1.93	5.33	6.24	5.84	5.38	4.96	4.67
Spontaneous Students	43	M.	6.05	6.19	17.37	19.77	22.79	23.37	5.19	5.40
		S.D.	1.98	1.97	6.67	6.26	5.32	5.60	6.19	5.43
Divergent Students	53	M.	5.49	5.96	15.76	16.40	20.87	22.30	2.02	2.40
		S.D.	2.32	1.92	5.41	5.85	5.24	5.34	3.64	3.66

TABLE XVII (continued)

Group	N		Originality		Creative Independence		Flexibility		Object Question	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
Group A-1, B-1, C-1	12	M.	5.08	6.17	15.67	17.50	23.08	25.17	4.50	3.50
		S.D.	2.61	2.41	6.89	8.24	5.85	6.62	5.71	4.01
Group A-1, B-1, C-2	13	M.	6.00	6.31	18.39	21.23	24.77	24.54	1.69	3.46
		S.D.	1.73	1.84	4.61	7.57	6.19	5.98	2.43	3.69
Group A-1, B-2, C-1	10	M.	5.90	6.00	17.60	19.50	19.70	21.80	3.10	3.30
		S.D.	2.42	2.06	7.82	5.72	4.83	5.51	5.65	4.08
Group A-1, B-2, C-2	11	M.	4.82	6.00	14.73	17.09	17.91	20.46	2.91	3.82
		S.D.	1.78	2.10	4.27	6.41	4.16	5.52	5.13	5.51
Group A-1, B-2, C-1	11	M.	5.55	6.36	16.46	17.91	21.73	21.55	3.36	3.46
		S.D.	2.25	1.86	6.89	6.07	4.15	4.70	4.57	5.63
Group A-2, B-1, C-2	14	M.	6.14	5.50	15.71	16.57	22.64	22.50	3.79	3.86
		S.D.	2.32	1.95	5.76	5.35	5.68	4.47	4.66	4.70
Group A-2, B-2, C-1	11	M.	6.55	6.27	15.09	16.55	21.00	22.36	4.09	5.09
		S.D.	1.92	1.62	6.40	4.99	3.66	5.32	6.33	6.06
Group A-2, B-2, C-2	14	M.	5.79	6.00	17.86	17.07	21.86	23.21	4.00	3.50
		S.D.	2.36	2.00	6.01	5.05	5.52	5.38	6.75	5.24

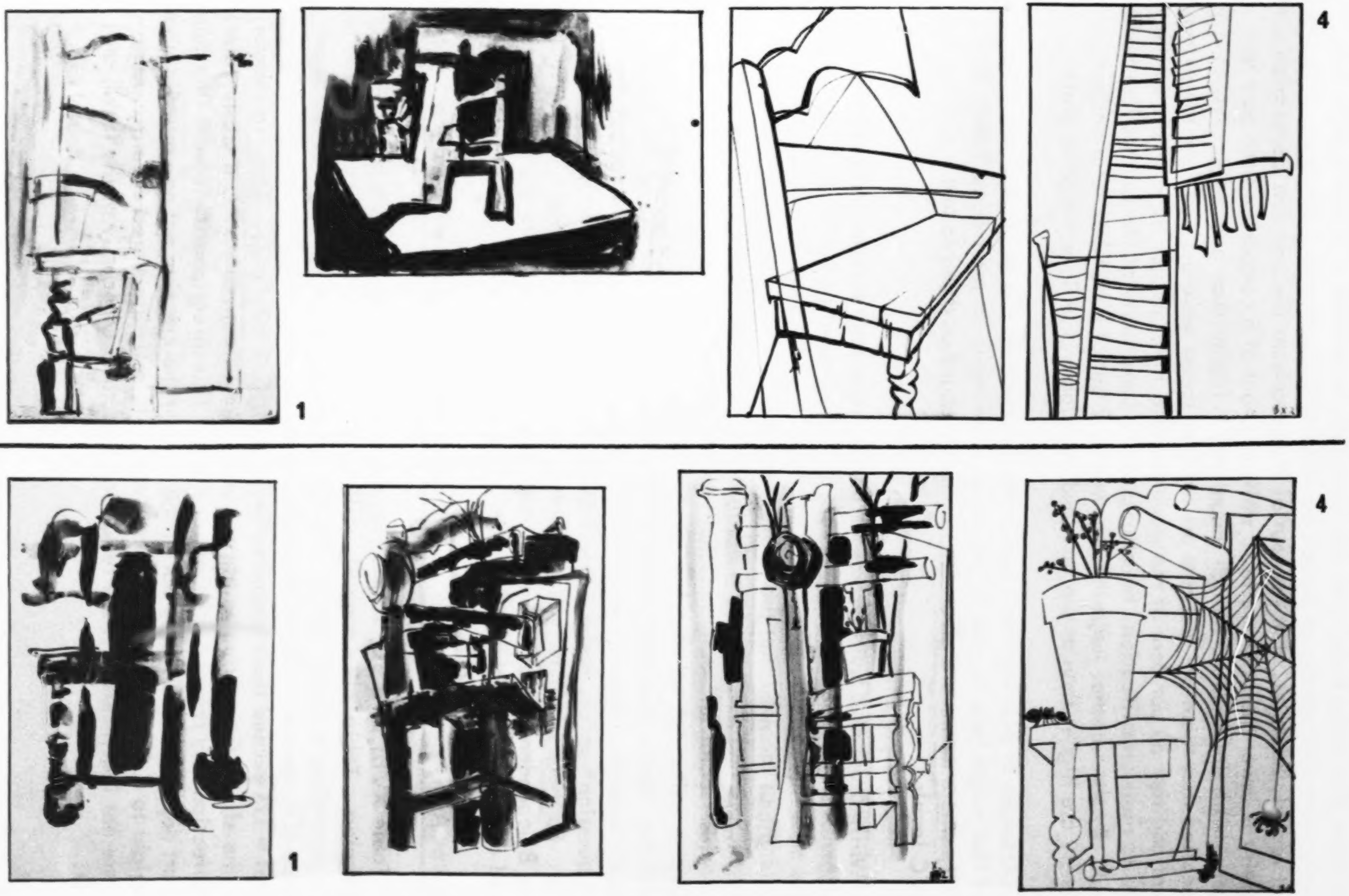


FIGURE 9 SEQUENCES SHOWING SPONTANEOUS STRATEGY TO DIVERGENT STRATEGY TRANSITIONS

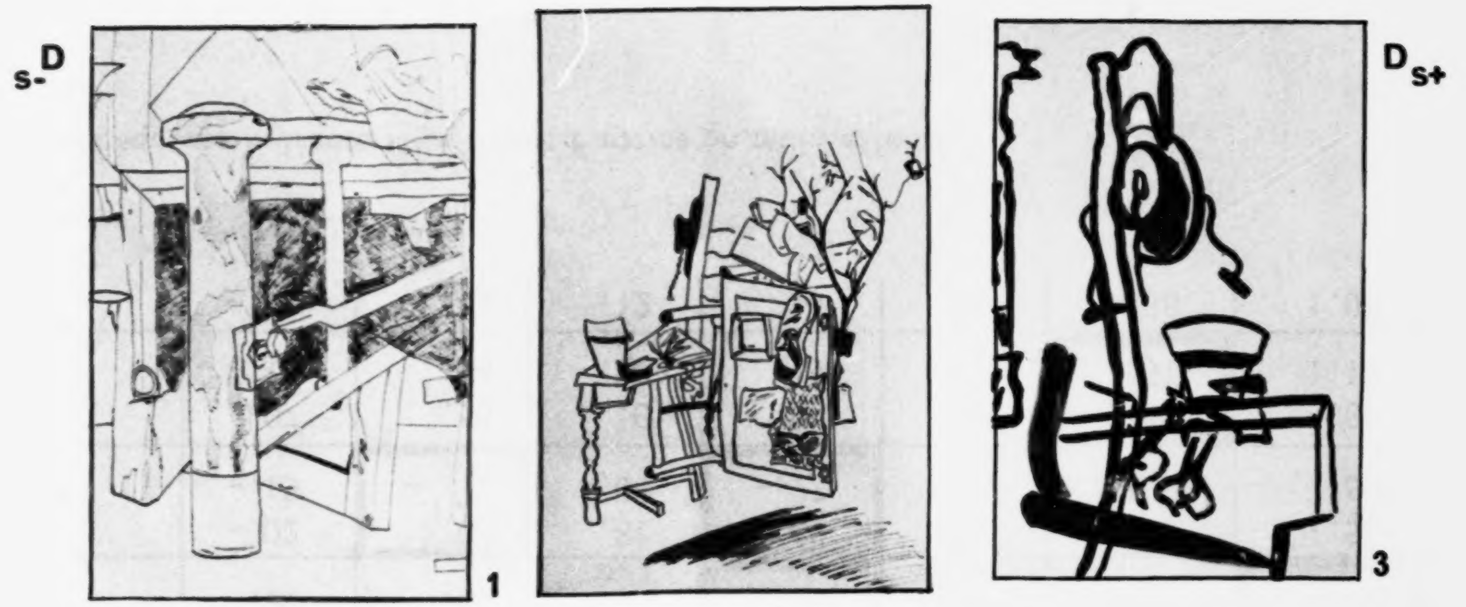
page 189 Appendix G) are relatively high (from .634 to .873). But Table VII, page 62, indicates that these 8 measures are positively correlated with spontaneity and negatively with divergency, as judged by internal and external judgments. This table does not reveal, however, that in 8 out of 8 comparisons the post test correlation with spontaneity is lower than the pre test, while in 5 out of 8 comparisons the post test correlation with divergency, though negative, is higher than at pre test. When it is then recalled that these pre and post art strategy scores were derived from the external judgment and that 60 per cent of the students made their greater gains in the strategy opposite to their classification, something of the complexity of the interactions becomes apparent. By the internal judgments, however, 7 out of 8 post test relationships on spontaneity are higher than at pre test (and the eighth is still very high at post).

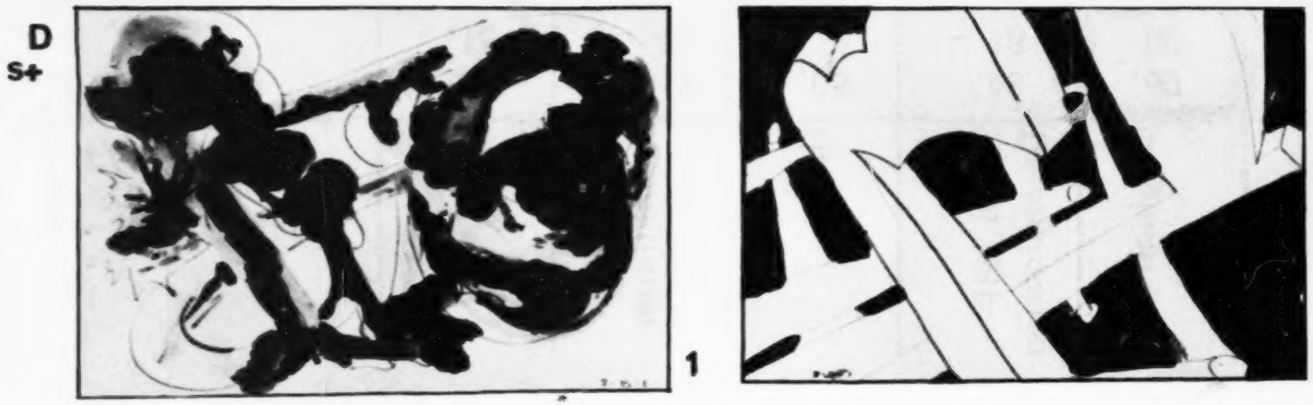
Attempts at plotting the 2 and 3 way interactions did not reveal any orderly patterns that might help to clarify this issue. The reader is referred to Tables XVI and XVII, where means are given for treatment subgroups down to and including the A x B x C levels.

While 5 out of 6 main effects are in the expected direction, these effects are not independent of combinations of levels on the 3 remaining factors in each comparison, and must therefore be interpreted with caution. Examination of correlations within subgroups showed that the 43 students classified as spontaneous had a high correlation, pre and post, between the internal spontaneity complexity judgment and the variables "social self-determination" and "creative independence." The 53 classed as divergent had a high relationship between the internal divergent complexity judgment and the "object question" variable. For these latter students, on the spontaneous complexity internal judgment, significant correlations with all variables but the "object question" occur, and in these 7 instances post test relationships run higher than pre. Further, spontaneity scores (internal) correlate rather highly throughout with the 8 dependent variables here discussed, but very much more highly under the expected or "good" treatments, A-1, B-1, and C-1.

Summary of Analyses of Variance of Dependent Variables of Creative Action

Table XVIII, page 90, summarizes mean gains for main effects on the 4 experimental factors. Table XIX, page 91, still further summarizes the direction of the main effects, according to factor levels. For factors A, B, and C, there is a significant difference (Chi square = .05) between the times the expected directions (A-1, B-1, C-1 total = 17) exceed their opposites (A-2, B-2, C-2 total = 7). Thus, in summary, despite the slight fluctuation within the small group treatment cells, there is stability to the directionality shown on the main effects. This directionality repeats that found for the art dependent variables, but in the case of the creative action variables gives more weight to C-1, interactive setting, and A-1, self-discovered criteria. Main effects are not independent of the remaining 3 factors, especially of the levels of factor D.





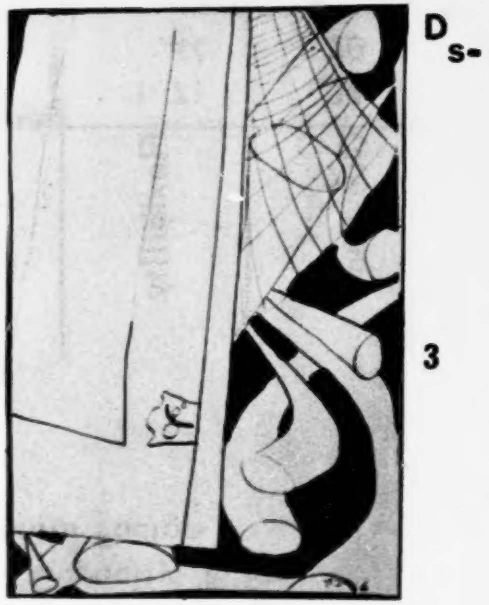


FIGURE 10

SEQUENCES SHOWING INTERNAL TRANSITIONS WITHOUT CHANGE OF STRATEGY

TABLE XVIII

Mean Gains on Dependent Variables Representing the Capacity for Creative Action for Main Effects on the Four Experimental Factors

CREATIVE ACTION VARIABLES

FACTORS	Complexity	Aestheticism	Theory	Social Self-Determination	Originality	Creative Independence	Flexibility	Object Question	N
A-1	-.37	.48	.06	.48	.60	2.20	1.71	.34	46
A-2	.16	.40	.17	-.18	.00	.62	.44	.20	50
B-1	-.20	.79	.16	.49	.22	1.63	.16	.25	50
B-2	.03	.06	.07	-.24	.35	1.11	2.02	.28	46
C-1	-.02	1.08	.31	.62	.33	1.72	1.56	.00	44
C-2	-.15	- .11	-.04	-.27	.24	1.09	.62	.49	52
D-1	.07	.56	-.10	.07	.08	2.45	.89	.01	43
D-2	-.22	.34	.30	.19	.45	.51	1.18	.48	53
Grand Mean	-.09	.44	.12	.14	.28	1.38	1.05	.27	96

Note: Blackened squares indicate significant F ratios on main effects.

TABLE XIX

Summary of Direction of Factor Means Showing
Favored Factor Levels (Main Effects) on the Eight Creative Action Variables

CREATIVE ACTION VARIABLES

FACTORS	Complexity	Aestheticism	Theory	Social Self-Determination	Originality	Creative Independence	Flexibility	Object Question	Level 1 2	Level 2 1
A	A-2	A-1	A-2	A-1	A-1*	A-1	A-1	A-1	6	2
B	B-2	B-1	B-1	B-1*	B-2	B-1	B-2**	B-2	4	4
C	C-1	C-1*	C-1	C-1*	C-1	C-1	C-1	C-2	7	1
Level 1>2	1	3	2	3	2	3	2	1	17[1]	
Level 2>1	2	0	1	0	1	0	1	2		7
Favors	D-1	D-1	D	D-2	D-2	D-1*	D-2	D-2		

*Significant F ratio in the expected direction (5 times)
**Significant F ratio in unexpected direction (1 time)

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[1] Total times A-1, B-1, C-1>A-2, B-2, C-2 is significant at the .05 level ($\chi^2 = 4.16$, on 50-50 hypothesis, exceeding 3.84, χ^2 for 1 d.f.)

V. The Major Experiment: Dynamics within the Experiment as Seen on the Art Dependent Variables (External Judgment)

Because the external judgments were done over the 384 total of week by week studio panels, it was possible to plot curves of change and perform analyses of variance showing period to period gains or losses as compared with the beginning and uninfluenced studio one base. Figure 11 and Figure 12, Appendix L, pages 223 and 224, show changes for the total group and the junior and freshman samples on the 3 external judgments (aesthetic quality, spontaneous strategy complexity, and divergent strategy complexity).

Aesthetic quality will first be discussed in its period to period changes. Figures 13 through 16, Appendix L, pages 227 and 228, present in graphic form the curves for the 4 separate factors in terms of mean gains for periods 2, 3, and 4. Figure 17, Appendix L, page 229, shows the same curves of change when they are averaged over A-1, B-1, C-1 and A-2, B-2, C-2. Table 77, Appendix L, page 225, gives the mean gains upon which the figures mentioned above are based.

Table XX, page 93, summarizes the analyses of variance on the aesthetic quality variable for the experimental periods. It can be seen that period 3 and 4 both show significant F ratios for B-1, process feedback, over B-2, product feedback. Unlike the cumulative analysis (repeated for convenience on Table XX), there is a significant 2 and 3 way interaction occurring in 2 periods were gains were analyzed. Period 3 shows the greatest differences in means on factor B. After period 2, factors A, B, and C show all mean gains in the expected directions.

For spontaneity, or spontaneous strategy complexity, as also judged on the external judgments, Figures 18 through 21, Appendix L, pages 229 through 231, present in graphic form the curves for the 4 separate factors in terms of mean gains for periods 2, 3, and 4. Figure 22, Appendix L, page 231, shows the same curves of change when they are averaged over A-1, B-1, C-1 and A-2, B-2, C-2. Table 77, Appendix L, page 225, gives the mean gains upon which the figures mentioned above are based.

Table XXI, page 94, summarizes the analyses of variance on the spontaneous strategy complexity or spontaneity variable. Periods 2, 3, and 4 all show significant F ratios for divergent students, D-2, over spontaneous students, D-1. The greatest difference in mean gains for factor D is shown in period 2. As with the cumulative analysis included in Table XXI, 3 and 4 factor interactions occur in each period.

Figure 22, Appendix L, page 231, shows A-1, B-1, C-1 in combination to be superior to A-2, B-2, C-2 for the spontaneity variable at each studio period where gain could be observed, but the differences are not as pronounced as in Figure 17, Appendix L, page 229, where similar results were presented for aesthetic quality.

TABLE XX

Summary of Analyses of Variance[1]
External Art Judgment: Aesthetic Quality, by Experimental Periods
N=96

Source of Variation[2]	Direction	Period 2		Period 3		Period 4		Cumulative	
		F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	B-1>B-2	-----	----	7.320	.01	3.250	.10	5.181	.05
C	------	-----	----	-----	----	-----	----	-----	----
D	------	-----	----	-----	----	-----	----	-----	----
AB	------	-----	----	-----	----	-----	----	-----	----
AC	------	-----	----	-----	----	-----	----	-----	----
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	-----	----	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	3.719	.10	-----	----	-----	----
ABD	------	-----	----	-----	----	-----	----	-----	----
ACD	------	-----	----	-----	----	-----	----	-----	----
BCD	------	9.028	.005	-----	----	-----	----	-----	----
ABCD	------	-----	----	-----	----	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE XXI

Summary of Analyses of Variance[1]
External Art Judgment: Spontaneity, by Experimental Periods
N=96

Source of Variation[2]	Direction	Period 2 F-Ratio	Period 2 Probability	Period 3 F-Ratio	Period 3 Probability	Period 4 F-Ratio	Period 4 Probability	Cumulative F-Ratio	Cumulative Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	------	-----	----	-----	----	-----	----	-----	----
C	------	-----	----	-----	----	-----	----	-----	----
D	D-2>D-1	12.323	.005	5.079	.05	5.721	.025	10.550	.005
AB	------	3.960	.05	-----	----	-----	----	-----	----
AC	------	-----	----	-----	----	-----	----	-----	----
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	5.333	.025	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----
ABD	------	3.015	.10	5.282	.025	4.650	.05	7.640	.01
ACD	------	4.562	.05	-----	----	-----	----	-----	----
BCD	------	-----	----	-----	----	-----	----	-----	----
ABCD	------	7.271	.01	3.644	.10	-----	----	4.585	.05

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

Nevertheless, in all instances but factor A for period 4, all differences in mean gains are in the expected directions for factors A, B, and C for all periods on the spontaneity variable.

For divergency, or divergent strategy complexity, as judged on the external judgments, Figures 23 through 26, Appendix L, pages 237 and 238, present in graphic form the curves for the 4 separate experimental factors in terms of mean gains for periods 2, 3, and 4. Figure 27, Appendix L, page 234, shows the same curves of change when averaged over A-1, B-1, C-1 and A-2, B-2, C-2. Table 78, Appendix L, page 226, gives the mean gains upon which the figures mentioned above are based.

Table XXII, page 96, summarizes the analyses of variance on the divergent strategy complexity or divergency variable. Periods 2 and 4 show significant F ratios for spontaneous students, D-1, over divergent students, D-2. The greatest difference in mean gains for factor D is shown in period 2. As with the cumulative analysis included in Table XXII, significant interactions occur (periods 2 and 4).

Figure 27, Appendix L, page 234, shows, in contradiction to the comparable graphs for aesthetic quality (Figure 17, page 229) and spontaneity (Figure 22, page 231), that A-2, B-2, C-2 in combination are superior to A-1, B-1, C-1 for the divergency variable. Thus, gains in divergency on the external judgment appear to run contrary to all the other art gains, which almost without exception favor the expected directions A-1, B-1, C-1 over A-2, B-2, C-2. Only for period 4, factor A, does the difference run in the expected direction. For this reason, the possibility exists that the divergency variable on the external judgment may not represent purely divergent strategy complexity as it was meant to, but has also picked up loss of spontaneity without the gain of conceptual innovation and formal discoveries usually associated with the divergent strategy. Nevertheless, it has been pointed out that external and internal judgments of divergent strategy complexity correlate .748. The external divergency judgment shows, however, the lowest pre with post correlation, .551, of all the external judgments. Aesthetic quality is .750, and spontaneity is .720.

Summary of Analyses of Variance Showing Period to Period Dynamics on the Art Dependent Variables (External Judgments)

Figure 28, Appendix L, page 234, summarizes gains on the expected or "good" treatments (A-1, B-1, C-1) in comparison with their counterparts (A-2, B-2, C-2) for all 3 external art dependent variables for the experimental periods. Divergency, again, yields the only case of reversal, the unexpected directions always being superior to the expected (when taken as a unit). The curves for aesthetic quality show the clearest separation between the "good" and "poor" treatments. For divergency, however, the gains are cumulative or progressive for both "good" and "poor" treatments. Aesthetic quality and spontaneity hit a peak at period 3, maintained in period 4 in the former case, lost in the latter. Greatest differences between comparable curves occur on all 3 variables for period 3, suggesting a cumulative effect and peak for treatments.

TABLE XXII

Summary of Analyses of Variance[1]
External Art Judgment: Divergency, by Experimental Periods
N=96

Source of Variation[2]	Direction	Period 2 F-Ratio	Period 2 Probability	Period 3 F-Ratio	Period 3 Probability	Period 4 F-Ratio	Period 4 Probability	Cumulative F-Ratio	Cumulative Probability
A	------	-----	----	-----	----	-----	----	-----	----
B	------	-----	----	-----	----	-----	----	-----	----
C	------	-----	----	-----	----	-----	----	-----	----
D	D-1>D-2	8.410	.01	-----	----	5.029	.05	7.477	.01
AB	------	-----	----	-----	----	2.884	.10	-----	----
AC	------	-----	----	-----	----	-----	----	-----	----
AD	------	-----	----	-----	----	-----	----	-----	----
BC	------	-----	----	-----	----	-----	----	-----	----
BD	------	-----	----	-----	----	-----	----	-----	----
CD	------	-----	----	-----	----	-----	----	-----	----
ABC	------	-----	----	-----	----	-----	----	-----	----
ABD	------	6.391	.025	-----	----	3.239	.10	4.970	.05
ACD	------	6.051	.025	-----	----	-----	----	3.368	.10
BCD	------	-----	----	-----	----	-----	----	-----	----
ABCD	------	-----	----	-----	----	-----	----	-----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

Aesthetic quality reveals the clearest effect on factor B, in terms of dynamics, and shows progressive cumulative gains for both spontaneous and divergent students (see Figures 14 and 16, Appendix L, pages 227 and 228). Significant main effects occur on factor B, favoring B-1 over B-2, for periods 3 and 4, and cumulatively over all periods. No interactions occur on the cumulative analysis, but two factor interactions occur on the period by period analyses.

On spontaneity, significant gains occur for each period and cumulatively for divergent students. The reverse is true for divergency, where gains occur in all but period 3, and favor spontaneous students. Gains in spontaneity are affected in the expected direction by factors A, B, and C, but such gains are in the unexpected direction on the divergency variable. For both spontaneity and divergency some 2 and 3 way interactions occur, suggesting that the main effects on factor D cannot be interpreted as being independent of factors A, B, and C.

VI. The Teaching Experiment: Art Dependent Variables (External Judgments)

Table IV, page 52, presented the design for the teaching experiment. Tables 79 through 82, Appendix M, pages 237 through 240, give the analysis of variance figures for each external art dependent variable, taken one analysis at a time. These tables give the detail on which the summaries are based. There are 4 dependent variables derived from the external judgments. Three of these are direct results of judgment: aesthetic quality, spontaneous strategy complexity, and divergent strategy complexity. The fourth was called "greatest strategy gains" and was meant to parallel the "within strategy" variable derivable from internal judgments (internal judgments were not made on the works in the teaching experiment). The greatest strategy gain score disregards the strategy name and gives credit to each student for his greater strategy score.

In the teaching experiment the same analysis of variance technique was used as in the major experiment (see Snedecor and Cox, 65). Unlike the major experiment, there was no significant disproportionality in the teaching experiment. Therefore no reduction factor was applied to the sums of squares.

Table XXIII, page 98, summarizes the analyses of variance for the 4 external or comparative art dependent variables. Two significant main effects appear. On the divergency variable, D-1, sustaining questions, are significantly superior to D-2, entry questions. On the greatest strategy gain variable, delayed process feedback, A-1, is significantly superior to immediate process feedback, A-2. There is a significant 3 factor interaction on the greater strategy gain variable, indicating that the main effect on factor A is not independent of factors C and D.

TABLE XXIII

Summary of Analyses of Variance[1]
Teaching Experiment: Art Dependent Variables (External or Comparative Judgments)
N=31

		Aesthetic Quality		Spontaneity		Divergency		Greatest Strategy Gain	
Source of Variation[1]	Direction	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability
A	A-1> A-2	----	----	----	----	----	----	7.603	.05
B	----	----	----	----	----	----	----	----	----
C	----	----	----	----	----	----	----	----	----
D	D-1>D-2	----	----	----	----	6.019	.05	----	----
AB	----	----	----	----	----	----	----	----	----
AC	----	----	----	----	----	----	----	----	----
AD	----	----	----	----	----	----	----	----	----
BC	----	----	----	----	----	----	----	----	----
BD	----	----	----	----	----	----	----	----	----
CD	----	----	----	----	----	----	----	----	----
ABC	----	----	----	----	----	----	----	----	----
ABD	----	----	----	----	----	----	----	----	----
ACD	----	----	----	----	----	----	----	14.654	.01
BCD	----	----	----	----	----	----	----	----	----
ABCD	----	----	----	----	----	----	----	----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

Summary of Analyses on the Teaching Experiment

Table XXIV, page 100, gives mean gains for the 4 external art dependent variables for main effects on the 4 experimental factors. Table XXV, page 101, still further simplifies these trends by emphasizing the favored factor levels only. Several points of interest emerge from these tables. Directions on factor A are such as predicted in the earlier discussion on page 54, where the factors were listed according to their predicted strategy linkage, following a reinforcing viewpoint, or placing similar element with similar element. Thus, as predicted, delayed process feedback, A-1, influences gains in divergency, and immediate process feedback, A-2, is associated with gains in spontaneity, although neither main effect is significant. The stronger mean difference on aesthetic quality favoring delayed process feedback, A-1, and the significant main effect on greatest strategy gain favoring A-1, indicate that delayed process feedback is generally a more powerful treatment influence than immediate process feedback, even though the two methods relate to the predicted strategy linkages.

On factor D, directions are opposite to predicted strategy linkage, with entry questions, D-2, associated with gains in spontaneity, and sustaining questions, D-1, influencing gains in divergency (the latter a significant main effect). Sustaining questions, D-1, generally have a slight edge over entry questions, since they are also associated with gains in aesthetic quality (but not significantly). In summary, in terms of factor D, like goes with unlike. The C x D interaction on aesthetic quality, though not quite at the .10 level, further corroborates this observation.

On factors B and C mean gains again do not support predicted strategy linkages. Interactions of B and C, while not significant, show that not only do spontaneous students, C-1, gain from interactive setting (B-1 and B-2), but divergent students, C-2, do also. Independent setting, B-3, was generally poor, for both kinds of students. Students gained in strategies opposite to their classification (and only 10% changed from their initial classification), and these changes were associated with the interaction with teachers of the opposite strategy to the students (though, again, these effects are not significant).

To summarize, delayed process feedback, A-1, is generally superior to immediate process feedback, A-2, even though there is a tendency for the former to be associated with gains in divergency and the latter with gains in spontaneity. The presence of teachers in the interactive setting, B-1 and B-2, is superior in one or the other form to the independent setting, B-3. Teachers in the strategy unlike the students facilitate gains in divergency and spontaneity, by students classed in the strategy opposite to the one where the gains are made. Sustaining questions, D-1, have a very slight edge over entry questions, D-2, but, unlike strategy linkage predictions, sustaining questions are associated with gains in divergency and entry questions with gains in spontaneity.

TABLE XXIV

Teaching Experiment: Mean Gains on External Art Dependent Variables
for Main Effects on the Four Experimental Periods

	External Art Dependent Variables				
Factors	Aesthetic Quality	Spontaneity	Divergency	Greatest Strategy Gain	N
A-1	6.05	2.69	2.41	18.82	15
A-2	-3.28	3.73	- 5.80	9.73	16
B-1	8.28	- 1.22	2.94	15.24	8
B-2	6.44	15.06	- 8.42	19.16	8
B-3	-5.30	- .71	- .85	10.85	15
C-1	2.23	- 2.46	.26	12.52	16
C-2	.18	9.29	- 4.05	15.84	15
D-1	3.48	- .49	5.94	13.30	16
D-2	-1.16	- 1.19	-10.11	15.01	15
Grand Mean	1.23	3.23	- 1.83	14.13	31

Blackened cells had significant main effects.

TABLE XXV

Teaching Experiment: Summary of Factor Means Showing Favored Factor Levels (Main Effects) on the External Art Dependent Variables

External Art Dependent Variables

Factors	Aesthetic Quality	Spontaneity	Divergency	Greatest Strategy Gain	Totals
A	A-1	A-2	A-1	A-1*	A1 = 3, A2 = 1
B	B-1, B-2	B-2	B-1	B-2, B-1	B1 = 3, B2 = 3, B3 = 0
C	C-1	C-2	C-1	C-2	C1 = 2, C2 = 2
D	D-1	D-2	D-1*	D-2	D1 = 2, D2 = 2

*F ratio is significant for main effect.

TABLE XXVI

Summary of Analyses of Variance[1]
Teaching Experiment (External Art Judgment): Aesthetic Quality, by Experimental Periods
N=31

Source of Variation[1]	Direction	Period 3 F-Ratio	Period 3 Probability	Period 4 F-Ratio	Period 4 Probability	Period 5 F-Ratio	Period 5 Probability	Cumulative F-Ratio	Cumulative Probability
A	A-1>A-2	----	----	6.210	.05	4.135	.10	----	----
B	B-2>B-1>B-3	----	----	6.905	.025	----	----	----	----
C	----	----	----	----	----	----	----	----	----
D	----	----	----	----	----	----	----	----	----
AB	----	----	----	----	----	----	----	----	----
AC	----	----	----	----	----	----	----	----	----
AD	----	----	----	---	----	----	----	----	----
BC	----	----	----	3.696	.10	----	----	----	----
BD	----	----	----	----	----	----	----	----	----
CD	----	----	----	4.696	.10	4.709	.10	----	----
ABC	----	----	----	----	----	----	----	----	----
ABD	----	----	----	7.007	.025	----	----	----	----
ACD	----	----	----	----	----	----	----	----	----
BCD	----	----	----	----	----	----	----	----	----
ABCD	----	----	----	----	----	----	----	----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

TABLE XXVII

Summary of Analyses of Variance[1]
Teaching Experiment (External Art Judgment): Spontaneity, by Experimental Periods
N=31

Source of Variation[2]	Direction	Period 3 F-Ratio	Period 3 Probability	Period 4 F-Ratio	Period 4 Probability	Period 5 F-Ratio	Period 5 Probability	Cumulative F-Ratio	Cumulative Probability
A	----	----	----	----	----	----	----	----	----
B	----	----	----	----	----	----	----	----	----
C	----	----	----	----	----	----	----	----	----
D	----	----	----	----	----	----	----	----	----
AB	----	----	----	----	----	----	----	----	----
AC	----	----	----	5.522	.10	----	----	----	----
AD	----	----	----	----	----	----	----	----	----
BC	----	----	----	----	----	----	----	----	----
BD	----	----	----	----	----	----	----	----	----
CD	----	----	----	----	----	----	----	----	----
ABC	----	----	----	----	----	----	----	----	----
ABD	----	----	----	----	----	----	----	----	----
ACD	----	4.105	.10	----	----	----	----	----	----
BCD	----	----	----	----	----	----	----	----	----
ABCD	----	----	----	----	----	----	----	----	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

TABLE XXVIII

Summary of Analyses of Variance [1]
Teaching Experiment (External Art Judgment): Divergency, by Experimental Periods
N=31

Source of Variation[2]	Direction	Period 3 F-Ratio	Period 3 Probability	Period 4 F-Ratio	Period 4 Probability	Period 5 F-Ratio	Period 5 Probability	Cumulative F-Ratio	Cumulative Probability
A	----	----	----	----	----	----	----	----	----
B	----	----	----	----	----	----	----	----	----
C	----	----	----	----	----	----	----	----	----
D	D-1>D-2	----	----	4.535	.10	9.615	.025	6.019	.05
AB	----	----	----	----	----	----	----	----	----
AC	----	----	----	----	----	----	----	----	----
AD	----	----	----	----	----	----	----	----	----
BC	----	----	----	----	----	----	----	----	----
BD	----	----	----	----	----	----	----	----	----
CD	----	----	----	----	----	5.569	.10	----	----
ABC	----	----	----	----	----	----	----	----	----
ABD	----	----	----	----	----	----	----	----	----
ACD	----	----	----	----	----	----	----	----	----
BCD	----	----	----	----	----	4.417	.10	----	----
ABCD	----	----	----	----	----	----	----	----	----

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[1] For method computation, see Footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

VII. The Teaching Experiment: Period to Period Dynamics on the External Art Dependent Variables

Tables 83 and 84, Appendix M, pages 241 and 242, show mean gains for treatment groups by experimental periods, for aesthetic quality and gains in spontaneity and divergency. Figures showing curves of change were not prepared for these data.

Table XXVI, page 102, summarizes period by period analyses of variance for aesthetic quality. Although the cumulative analysis of variance (included in Table XXVI for convenience) showed no significant main effects, when taken period by period significant main effects occur in period 4, where delayed feedback, A-1, is superior to immediate, A-2; and the interactive settings, B-2 and B-1, are superior to the independent setting, B-3. In period 5, delayed process feedback, A-1, is again superior to its counterpart. In period 4 there are 2 and 3 way interactions, while in period 5 there is only one significant interaction (C × D, with spontaneous students doing better on entry questions, divergents on sustaining). The general superiority of delayed feedback, A-1, seems clear, even though on the cumulative analysis it did not quite reach significance. Further, factor A is relatively independent of the other factors.

Table XXVII, page 103, summarizes period by period analyses of variance for gains in spontaneity. A significant A x C interaction in period 4 reveals that divergent students, C-2, gain significantly under delayed feedback, A-1, while spontaneous students, C-1, have their gains associated with immediate feedback, A-2.

Table XXVIII, page 104, summarizes period by period analyses of variance for gains in divergency. The clear superiority of sustaining questions, D-1, over entry questions, D-2, for gains in divergency is revealed by significant main effects for periods 4 and 5 and for the cumulative analysis. A significant C x D interaction in period 4 indicates that it is mostly the divergent students, C-2, who are gaining significantly under sustaining questions, D-1.

Summary of Period to Period Analyses for the Teaching Experiment

Period by period analyses of variance further clarify the cumulative main effects. In the case of aesthetic quality and spontaneity there were no cumulative main effects or simple interactions, but these appeared in the period by period analyses.

For aesthetic quality, delayed feedback, A-1, and interactive setting, B-2 and B-1, were significantly superior to their counterparts. Factor A was relatively independent of the other factors, suggesting the general superiority of delayed feedback, A-1. Simple interactions showed spontaneous students doing better on entry questions, divergents on sustaining.

On spontaneity no significant main effects appeared. A simple interaction showed divergent students gaining in spontaneity under delayed feedback, with spontaneous students making gains under immediate feedback.

Period by period analyses showed that sustaining questions generally influence gains in divergency.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

I. Summary of the Problem, Related Studies, and Procedure

Problem

Through explicit assumptions and prior findings, a tentative general theory of learning in art was developed. A major experiment was designed to simulate a favorable learning environment for art activity.

The general learning model of the major experiment was presented as a series of cyclic reformulations brought about by self-reflective feedback. Art activity was described as an intrapersonal dialogue between the artist and the evolving art object and was further described as a private, covert affair. The studio phase of experimentation was set off from a formal evaluative phase to both honor the nature of the art dialogue and also to make the latter accessible to educational influence. What was called a "relatively invariant frame" was represented by constancy of medium, tools, stimulus, and procedures, and had for researcher and participant alike the function of creating a stable ground against which to focus on change or dynamics. By removing threat and extrinsic motivational incentives, a "value neutral field" for experimentation was set up in an effort to create a favorable climate for a learning study in art.

In general terms, this study asked the following questions:

1. What is the effect of systematic variation of self-reflective feedback during the evaluative phase of experimentation, as represented by: (a) internal or external evaluative locus (subjective or objective criteria for evaluation); (b) process or product form of self-reflective feedback; and (c) interactive or independent setting for self-reflective evaluation? Further, how do the above 3 conditions interact with (d) students classed as operating in the spontaneous or divergent art strategy? Thus, the treatment phase of the major experiment attempted to study the effect of variation of the content (and locus), form, and source (or setting) of self-reflective feedback on art dependent variables and dependent variables representing the capacity for creative action, and to see how these might interact with the student's underlying art strategy.

2. Is it possible, through configurational approaches, to further analyze judgments of art products and processes? Domain mapping of art criteria and judgments was attempted.

3. What are the dynamics of art processes observed within the major experiment? This question later became that of defining art strategies, once regularities and

hierarchies of art procedures were observed.

4. How might the findings of the major experiment, if clear, be further related to the teaching-learning process? To answer this question, a teaching experiment was designed which studied: (a) delayed or immediate process feedback; (b) interaction with spontaneous or divergent teachers, or independent evaluation by the student himself; (c) interactions of treatment factors on students classified as in the spontaneous or divergent strategy; and (d) the use, by teachers, of sustaining or entry questions in the evaluative setting.

Related Studies

The literature provided few, if any, theories on how learning in art takes place. Historically, the progressive era in education brought widespread acceptance of creative expression as a primary goal of art education, but practices which once furthered this aim lost significance as the battle against a rigid instructional methodology was won. Studies emphasizing "depth" as opposed to "depth" in the curriculum, and "student-centered" evaluation, led to the theoretical base of this study. Client-centered counseling supplied operational definers of a teacher role designed to encourage student evaluative activity and intrinsic motivation.

Early inquiries into the relationship between art and general creativity were as polemic as scientific. When paper-and-pencil tests of creativity appeared, these did not relate to art performances, especially as judged on aesthetic quality, which is apparently a complex domain.

The isolation of an internally consistent spontaneity domain, as judged from art products, led to the finding that spontaneity and measures of "creative personality" were significantly related. Further, the nature of these relationships was such that they paralleled in content the reports of social scientists studying creativity. It was eventually possible, following this lead, to isolate strong predictors of both spontaneity and aesthetic quality in art. These predictors related even more highly to art criterion judgments after the passage of time and with continued art production. Thus they were felt to represent a "predisposition" for learning in art and became, in concept, the dependent variables representing the capacity for creative action in this report. Whether such measures were influenced by treatment conditions was unclear, because controlled experiments had not been performed where they were dependent variables.

As an art criterion domain, spontaneity has shown repreatedly higher judge reliability than aesthetic quality. The judge's personality and, by inference, his art strategy, have been shown to be factors in art judgment. Variability attributable to heterogeneity of art objects, media, and working conditions, has been partially controlled by a testing device requiring a series of quick "thumbnail sketches" from a standard stimulus. This sampling device made possible the inclusion of process-like criteria and led to the isolation of 3 essentially independent domains: a spontaneous, a divergent, and a formal domain.

Leaders in art education have long argued for a "process" emphasis. Over the last few years, several studies have shown the transition from an end-product to an in-process orientation. Cybernetics and General Systems Theory were seen as related to the concern of this report with processes, dynamics, and the individual as a complex system. The use of the term "strategy" herein, has much in common with its usage in recent psychological literature.

The teacher was seen as "represented" in the treatment conditions and underlying theory of the experiments of this research. It was acknowledged, however, that conditions for experimentation were more like those of a laboratory or the traditional studio than like the classroom. An effort to further pinpoint teacher influence in the teaching-learning process was made in the teaching experiment reported herein, where training, content focus, and personality of the teacher were factors.

Procedure

The testing device where quick thumbnail sketches were obtained from a standard stimulus was used to collect art objects or samples on which domain mapping could be attempted. Differential criteria were sought which could be applied by judges with high reliability and minimal subjectivity. By this means, the content (or parts) of global judgments was sought. Three essentially non-overlapping domains, designated as spontaneity, divergency, and formal emphasis, were isolated, with a total of 12 separate differential criteria.

Art strategy criteria, 40 in number, were developed to describe in detail the regularities over time and the hierarchies of procedures and tactics used by students when they developed their art. Two strategies, the spontaneous and the divergent, were defined. These strategies were laid bare by the process photographs taken at regular time intervals during each studio period of the experiment.

Predictors of art criteria were revised to meet the demands of the expansion of art criteria brought about by the domain mapping analyses. On the junior sample of the major experiment, 8 measures were chosen as the most economical set to represent the dependent variables of the capacity for creative action. The 8 measures were chosen for their significant pre test associations with the 4 art domains (evaluation having been added to spontaneity, divergency, and form emphasis). Two measures represented each art domain or dimension.

This newly validated predictor battery (and other measures scanned but not included as dependent variables) proved useful in other ways. It was a pool from which could be drawn initial descriptions of differences between students employing the spontaneous and divergent strategies.

Three kinds of art judgments were employed in this report: (1) differential criteria judgments, (2) internal or intra-individual judgments of art strategy complexity, and (3) external or comparative judgments. All 3 kinds became the source of art dependent variables in the major experiment. Upper and lower limit judge reliabilities for these 3 kinds of judgments were discussed, as well as the actual procedures by which the judges made their judgments.

The major experiment utilized a 4 factor design, with 2 levels for each factor (a 2x2x2x2 design). Factors A, B, and C were treatment factors, while D was an organismic or classification factor.

The sample used in the major experiment included, in phase one, all of the junior art education majors in pre service training at The Pennsylvania State University, Department of Art Education. Phase one was run during Spring Term, 1963. Phase two was run during Fall Term, 1963, and included all of the freshman art education majors in the same Department. There were 48 juniors and 48 freshmen, or a total of 96 subjects, in the major experiment.

The experiment proper took place over 4 weeks. During each week there was one 75 minute studio period. Before the next studio period, the following week, there was a 20 to 30 minute evaluation session during which treatment conditions were systematically varied.

In the studio session, students worked without instruction and in privacy from a constant stimulus, a complex, assemblage-like, many-sided still life. The medium was india ink, japanese brush, and drawing pen, with washes optional, and a standard white drawing pad. Photographs of working processes were taken, with a minimum of interruption, at 3, 6, and 9 minute intervals on the first product made after "warm up."

Independent variables were: factor A, self-discovered criteria (A-1) or externally supplied criteria (A-2); factor B, in-process feedback (B-1) or end-product feedback (B-2); factor C, interactive setting (C-1) or independent setting (C-2); and factor D, whether the student was initially classed as working in the spontaneous strategy (D-1) or the divergent strategy (D-2).

Although 2 sided tests of significance were applied, previous theory and findings suggested that conditions A-1, B-1, and C-1 should be superior to their counterparts. Of these expectations, factor C was most in doubt.

Dependent variables were of 2 kinds. Art dependent variables were obtained from results of differential, internal, and external art judgments. Dependent variables representing the capacity for creative action were the 8 measures validated on art criteria on the junior sample at pre test.

The interrelations of all of the dependent variables were studied through correlation matrices and factor analysis. A factor analysis of art strategy criteria was also performed.

The inclusion of factor D, the organismic or strategy classification independent variable, brought about a significant disproportionality in subclass numbers. This disproportionality disappeared in 3 factor analyses with factors A, B, and C. In the 4 factor analyses of the major experiment a reduction factor of .9352 was used to reduce mean squares, following the method of expected subclass numbers for unequal N's, with corrections for disproportionality.

The teaching experiment also utilized a 4 factor design (a 2x3x2x2 design). This experiment was designed after a pilot teaching-learning study was carried out in Winter Term, 1964. The teaching experiment involved 31 students and 8 students in the role of teachers. These were all junior pre service art education majors.

Independent variables were: factor A, delayed process feedback (A-1) or immediate process feedback (A-2); factor B, interaction with a spontaneous teacher (B-1) or a divergent teacher (B-2), or independent setting (B-3); factor C, whether the student was initially classed as working in the spontaneous strategy (C-1) or the divergent strategy (C-2); and factor D, the use of sustaining questions (D-1) or entry questions (D-2). As in the major experiment, treatment conditions were applied only during the evaluative phase of experimentation. Dependent variables for the teaching experiment were from external art judgments only.

Following a reinforcing viewpoint, likely linkages of strategy classifications with treatment factors were predicted. This method placed like element with like element--for example, immediate process feedback (A-2) was predicted to influence spontaneous students (C-1), while delayed process feedbac[illegible]-1) was predicted to go with divergent students (C-2). Two-sided tests of significance were utilized, however.

For both the major experiment and the teaching experiment, period to period changes were observed, graphed, and submitted to analysis of variance. This was done in an effort to get at dynamics of learning and treatment effects.

II. Conclusions and Implications: Structural Considerations among the Dependent Variables

1. Differential Art Criteria

It is possible to describe detailed and objective criteria which can be reliably judged from art objects, and which combined into essentially non-overlapping domains. Spontaneous, divergent, and formal domains were so defined in this study.

Discussion and implications. The identification of the differential criteria and the study of their configurations was an interim stage of development, superceded by the discovery of art strategies. In addition, the fact that global differential judgments were more sensitive as dependent variables than the single differential criteria or the domain totals throws doubt on the usefulness of the latter. Many of the differential criteria found their way into the 40 art strategy complexity criteria. Thus the differential criteria opened the way for a new look at the entire art criterion problem and supplied needed analytical content which could be synthesized in other applications.

2. Spontaneous and Divergent Art Strategies

Two art strategies can be defined which exhibit the regularities and procedural hierarchies over time demanded by the strategy concept. Nineteen strategy criteria were educed to judge the degree of complexity seen in the spontaneous strategy. Twenty-one criteria for the divergent strategy were similarly defined. Students in the 2 strategies differ not only in their art, but as described by the predictor battery.

Discussion and Implications. Factor analysis of the 40 strategy criteria showed the 2 strategies breaking down into several non-overlapping factors within each strategy. Students were able to place themselves into strategy designations, judging their own works, in significant agreement with expert judges (73 per cent). The multiple discriminant function technique correctly placed 83 per cent of the freshman sample into strategies using 7 pre test scores from the predictor battery. A 24 to 30 per cent strategy change or mobility is seen over the course of a 4 week experiment. Personality differences between the 2 strategies show the spontaneous student as self-confident, independent, interactive, and emerging from a turbulent environment; while the divergent appears more traditional, self-restrained, and emerging from a supportive environment. The 40 art strategy criteria supply a description of the 2 differing work orientations. The spontaneous student depends on holistic attacks, procedural flexibility, suggestion, central emphasis, movement, gesture, and medium interaction; while the divergent student begins with details or parts, works with control into elaboration or variation, is off-center, and uses formal distortion and conceptual innovation. All in all, the discovery of art strategies brought attention to individual differences of a pervasive nature, since they account for considerable differences on predictor batteries, art judgments, and in experimental treatment interaction. In addition, they led to a new kind of art dependent variable, the internal or strategy complexity judgment.

3. The Art Strategy Complexity or Internal Art Variable

It is possible to conceive of an individual's learning in art in terms of an increase in complexity in one or the other art strategy. Such judgments were developed for this study.

Discussion and Implications. A person can be seen as a dynamic system. By comparing later with earlier works by means of the 40 strategy criteria, it was possible to say how much more complex a student's work had become over his beginning benchmark. Such a judgment brought out considerations not sensed in the usual comparative judgment. The "vitality" or "health" of processes became the focus, as defined by the clarity of delineation of a strategy over time. Conditions of self-reflective feedback may have led to the idiosyncratic abstraction of style noted in most students' works.

The implication of such judgments is that they lay bare the restructuring of the subject's image-making intentions through the attention paid to his unfolding processes, and they reveal in some detail the nature of the reformulations occurring over time and under specific treatments. Much further study of this beginning look at strategies is suggested.

4. Relationships among Dependent Variables

Measures of the capacity for creative action relate significantly to both external (comparative) and internal (intra-individual) art judgments of spontaneous strategy complexity. External and internal judgments of art strategy complexity relate highly to each other.

Discussion and Implications. Tests traditionally associated with "creative personality," as represented by independence, spontaneous flexibility, rejection of authority, self-confidence, and other similar self-descriptive inventories, do not correlate with divergent art strategy judgments, or often correlate negatively (but not usually significantly), while these same measures show significant correlations with spontaneity. This suggests a need in future studies to include in the predictor battery tests which are also associated with the divergent strategy. The fact that external and internal judgments of art strategy complexity are highly intercorrelated, argues for retention of both kinds of judgments until more is known of their differences and similarities. The sensitivities of each as dependent variables in experimentation will be later discussed.

III. Conclusions and Implications: The Major Experiment as Seen in Analyses Using Cumulative Gains on the Dependent Variables

1. Differential Art Criteria Dependent Variables

The separate differential criteria, when used one at a time, did not prove to be very sensitive to experimental change. The global judgments, however, showed significant main effects favoring process feedback (B-1) and interactive setting (C-1) on aesthetic quality; process feedback (B-1) on spontaneity; and interactive setting (C-1) on the divergent domain global. In these instances, the main effects were independent of the other factors. On the formal domain, process feedback (B-1) and interactive setting (C-1) were likewise significant, but with heavy interactions.

Discussion and Implications. Only one out of 16 main effects, on the average, occurred on the detailed differential criteria and the 3 domain totals. One out of 2 main effects were significant on the global judgments. It therefore appears that "parts" of art objects described by such analytical processes as used on the differential criteria whatever their descriptive utility, do not respond sensitively as dependent variables, and do not, therefore, represent end values for attainment in themselves. Further, the domain totals reflect a like difficulty (or "humpty dumpty" effect, it being unknown how to synthesize them). Of 9 significant main effects, 8 favored the expected directions, all falling on B-1 and C-1. Why factor C influenced the drawing sequences done at post test but was not influential on the other art dependent variables judged on studio works is not known. It should be remembered that these analyses were done only on the junior sample (N-48).

2. External or Comparative Art Dependent Variables

Process feedback (B-1) has a significant effect on aesthetic quality which is independent of the other treatment factors. For aesthetic quality and spontaneity all mean gains were higher for predicted directions A-1, B-1, C-1 over their counterparts. For divergency, only factor A mean gains were in the expected direction. Divergent students (D-2) gain significantly in spontaneous strategy complexity, and spontaneous students (D-1) gain significantly in divergent strategy complexity. The latter 2 main effects are not independent of the other 3 treatment factors.

Discussion and implications. Expected directions occur on factors A, B, and C for aesthetic quality and spontaneity, but not for divergency. It was not expected that students would show gains in the strategy opposite to their classification. Some regression effect may be at work, but an examination of the means does not completely support this view (divergent means for divergent students, for example, go up at post test). The clear main effect on aesthetic quality favoring process feedback suggests that this treatment condition is the most potent influence on the quality of art produced.

3. Internal or Intra-Individual Art Dependent Variables (Strategy Complexity)

Mean gains for main effects on factors A, B, and C were all in the expected direction for the 3 main internal art dependent variables. On the within strategy variable, self-discovered criteria, A-1, and process feedback, B-2, are superior to their counterparts, and spontaneous students, D-1, gain over divergent students, D-2. These main effects are independent of the other factors and combine to show the within strategy variable as the most sensitive of the art dependent variables to experimental influence. Unlike the results for the external art dependent variables, spontaneous students, D-1, gain significantly on spontaneous strategy complexity, and divergent students, D-2, gain significantly on divergent strategy complexity. Three and 4 way interactions on these 2 variables suggest that the main effects on factor D are not independent of levels of factors A, B, and C.

Discussion and Implications. The question of why students gain significantly in the strategy opposite to their classification on the external analyses and within their strategy classification on the internal analyses is hard to resolve. It is felt that the internal judgment is inclined to depress one score at the expense of the other, although this was not intended; and, in fact, the correlation between the strategy scores is more highly negative for the external judgments than for the internal (-.708 as opposed to

-.499). Though 74 per cent of the subjects remained in the strategies in which they were classed by external judgments, 60 per cent made their greater gains in the opposite strategy, as opposed to 31 per cent on the internal judgments. Some aspects of this problem are likely honest differences occurring from the intra-subject and inter-subject perspectives. The implication arising from the significant main effects on the within strategy art dependent variable is that it is the most promising attack to date on the art criterion problem. Transcending, as it does, stylistic differences between the strategies, it fixes attention on the abstract quality of the complexity of the strategy. By inference, the more complex a strategy becomes over time, the more a style is being abstracted and the more it can express or handle. Birkhoff's "aesthetic measure" (13), which is presented as a ratio between "unity" or "harmony" and "complexity," is brought to mind. In dealing with comparable properties of strategies, even though the strategies are in the main opposed, great leverage in measurement is obtained. Here, in operational terms, is a concept comparable to those advanced in General Systems Theory. That this property is influenced significantly across the 2 strategies by the same treatment factors appears to be an important finding.

4. Summary of Conclusions on External and Internal Art Dependent Variables

Factor B is the most influential variable affecting art, with process feedback, B-1, always superior to product feedback, B-2, on the significant main effects. Factor A is next most influential, with A-1, self-discovered criteria, superior to A-2, externally supplied criteria. Factor C, though maintaining predicted directions, does not significantly affect art. On factors A, B, and C, on the 6 main art dependent variables (aesthetic quality, spontaneity, and divergency on the external judgments; within strategy, spontaneity and divergency on the internal), 16 out of 18 mean gains favored A-1, B-1, and C-1, with 8 of these as significant main effects. Those significant main effects on aesthetic quality and within strategy are independent of the other factors. Those on the 4 strategy complexity variables cannot be interpreted as independent of the other factors.

5. Dependent Variables Representing the Capacity for Creative Action

There are 6 significant main effects observable on the 8 creative action measures for factors A, B, and C. All but one of these is in the expected direction. In summary: for "social self-determination," B-1 and C-1 are significantly superior to their counterparts; for "aestheticism," C-1 is again significant; for "originality" and "creative independence," A-1 is significantly superior to A-2. The reversal occurs for "flexibility," where B-2 is superior to B-1. A look at the direction of factor means on A, B, and C, shows 17 out of 24 (a significant departure from chance) falling in the expected directions (A-1, B-1, C-1 > A-2, B-2, C-2). On seven creative action dependent variables there are some interactions, which indicate that the main effects are not independent of the levels of the other factors, particularly factor D, the strategy classification factor.

Discussion and Implications. Unlike the findings for art, significant main effects on the creative action variables show the influence of factors C and A most strongly. Factor B, the strongest factor affecting art dependent variables, has 2 main effects on the creative action variables, but the one favors B-2, the other B-1. That self-discovered criteria for evaluation, A-1, and interaction with an interested but essentially nondirective teacher representative, C-1, should have the strongest impact on the creative action variables, which largely represent the traditional "creative personality" image as it relates to art production, is of possible psychological and educational significance. This is especially so if the creative action variables are seen as at all representative of predisposition for learning or achievement in art, for the suggestion arises that differing educational influences affect predisposition from those affecting the art. Yet, the correlations between art dependent variables (especially in the case of spontaneity, internal judgments, for the entire sample) and creative action variables are uniformly high within "good" as opposed to "poor" treatment groupings, whether main factor levels or AxBxC subgroups are studied. This suggests that art and personality changes, though responsive to differing treatment conditions, may be mutually reinforcing. In short, it may be as likely that art leads personality as that personality leads art. This position is indeed supported by what may be interpreted as a "congruence effect," in which the personality correlates of subjects take on the directionality of the strategy which is becoming progressively more complex and apparently integrated. In terms of the internal strategy complexity judgments this is probably so, for on 5 out of 8 creative action variables, the relationship with spontaneous strategy complexity goes up at post test; whereas in 6 out of 8 cases it goes down with divergent strategy complexity. This reveals, again, the strategy bias to the creative action variables and does not indicate that an increase in divergent strategy complexity is associated with a decrease in "creative personality." Possibly such occurrences explain several interactions observable on most creative action variables, which make them difficult to interpret unambigiously. In summary, that the expected directions, A-1, B-1, C-1, show significantly greater mean gains over their counterparts indicates that treatment influences have the same directionality for art as for creative personality, with the additional insight that greater weight should be given process-feedback, B-1, in art, and self-discovered criteria and interactive setting, A-1 and C-1, in creative personality. Unlike the findings on aesthetic quality and within strategy complexity, main effects for creative action variables must be interpreted with caution because of 12 interactions. The creative action battery is biased, as is the creativity literature generally, toward the spontaneous strategy.

IV. Conclusions and Implications: The Major Experiment as Seen in Analyses of Period to Period Changes or Dynamics (External Art Dependent Variables)

In 15 out of 18 cases, the period 2, 3, and 4 gains on aesthetic quality and spontaneity occur in the expected directions on factors A, B, and C. The reverse is true for divergency, where in 8 out of 9 cases A-2, B-2, C-2 are superior to A-1, B-1, C-1. Curves for aesthetic quality show the clearest separation occurring over time between "good," and "poor" treatments. On divergency, though there is a reversal in treatment mean gains, the curves are cumulative or progressive for both "poor" and "good" treatments, but the latter is always lower.

Discussion and Implications. Greatest differences between comparable gains curves occur on all 3 variables for period 3, suggesting that treatments cause a cumulative effect or peak after which a plateau, levelling, or even a decline is noted. The steepest acceleration thus falls between period 2 and 3. Period by period analyses are to be recommended, because they often bring an increased sensitivity to interpretations which would be lost in looking only at cumulative or pre to post gains and significant F ratios. On aesthetic quality, for example, the curves for factors A-1, B-1, and C-1 were all generally positive and separate over time from A-2, B-2, C-2, even though factor B alone showed significant cumulative main effects. Thus these treatment factors appear to be mutually reinforcing. The cumulative significant main effect for aesthetic quality is shown in period to period analyses to occur significantly in periods 3 and 4 with period 3 the stronger difference. The suggestion arises that a period to period internal judgment would be possible by comparing a subject's treatment influenced works from a single studio period (2, 3, or 4) against his base, removing signs of period identity from the influenced works, and separating each such internal period judgment from another on the same subject by similar judgments on other subjects.

V. Conclusions and Implications: The Teacher Experiment

1. Cumulative Effects on the Art Dependent Variables (External Judgments)

Delayed process feedback, A-1, is superior to immediate process feedback, A-2, even though there is a tendency for the former to be associated with divergency and the latter with spontaneity. The presence of teacher representatives in the interactive setting, B-1 and B-2, is superior in one or the other form to the independent setting, B-3. Teachers classed in one strategy tend to facilitate gains in complexity in the opposite strategy. As in the case of external judgments in the main experiment, spontaneous students, C-1, gain in divergency, while the opposite is true for divergent students, C-2. Sustaining questions, D-1, have a slight edge generally over entry questions, D-2. Sustaining questions are associated with gains in divergency, while entry questions are associated with gains in spontaneity.

Discussion and Implications. This first study sought further refinements on factors influencing the teaching-learning process in art by building on outcomes of the major experiment (for example, in utilizing process feedback for all students) and asking further questions of them (as, whether delayed or immediate process feedback is preferable). Unlike predicted strategy linkages, which were based on a reinforcing viewpoint where like element was linked with like element, there is a suggestion that some treatments are generally superior, regardless of strategy, and that others tend to be associated with opposed and not similar linkages. Thus interactive setting, B-1 and B-2, are generally superior in the context of the teaching experiment, to independent setting, B-3. Similarly, delayed feedback, A-1, and sustaining questions, D-1, have a slight edge over their counterparts. Having said this, however, a case for opposites comes in for all factors but A, where a non-significant relationship associates delayed recall with divergency and immediate with spontaneity, as predicted. On factor B, divergent teachers, B-2, are heavily associated with spontaneity gains, and spontaneous teachers, B-1, are associated with gains in divergency. Students again show gains on strategies opposite to their classification, on factor C. On D, entry questions, D-2, are associated with gains in spontaneity and sustaining questions, D-1, with gains in divergency. Thus the suggestion arises that unlike elements as represented through treatment and classification factors facilitate learning in art, but that delayed process feedback and interactive setting are generally helpful (especially for aesthetic quality).

2. Period to Period Changes or Dynamics (External Art Dependent Variables

For aesthetic quality, A-1, delayed process feedback; D-1, sustaining questions; and B-1 and B-2, interactive setting, show consistent superiority to their opposites. Significant main effects occur during periods 4 and 5. Factor A is the most independent of the other factors. For spontaneity, divergent teachers, B-2, and entry questions, D-2, have mean gains consistently superior to their counterparts. A significant AxC interaction associates divergent students with delayed feedback and spontaneous students with immediate. On the divergency variable, sustaining questions, D-1, show significant superiority in main effects for periods 4 and 5.

Discussion and Implications. Again, the period to period analyses bring increased sensitivity over the cumulative analyses. In the case of aesthetic quality and spontaneity there were no significant cumulative main effects or simple interactions, but these appeared in period to period analyses. As in the major experiment, the middle experimental period (in this case period 4, because there were 2 uninfluenced studio periods used as the base) seems to show a peak effect, especially in the case of aesthetic quality. On the strategy complexity variables, however, several treatment factors show progressively accelerating curves. Apart from factor A, which exhibits a relative degree of independence of the other factors, treatment factors interact somewhat with one another, suggesting the increasing complexity brought to experimentation which seeks to simulate the teaching-learning process in a controlled setting.

VI. Concluding General Discussion

From its beginning position, this report has attempted to reflect the several issues upon which it has made some attack and the findings resulting: (1) the art criterion problem, through efforts at objective criteria and an analysis of their configurations; (2) the process focus, through the comparison of process with product feedback as an experimental variable, and, later, with the immediate or delayed timing of process feedback; (3) the discovery of two coherent art strategies, named the spontaneous and the divergent; an attempt at their definition through art process criteria and creative personality correlates; and their inclusion as a classification factor in the experiments; (4) the derivation of the internal or intraindividual art dependent variables, through utilization of the art strategy criteria and by considering one individual's works over time as a display of strategy complexity dynamics; (5) a first attack, through the within strategy complexity internal art dependent variable, at abstract properties cutting across strategies, which are sensitive to treatment influences; (6) the call for correction anew of the predictor battery, representing the capacity for creative action, finding it, like the creativity literature, biased toward the spontaneous strategy; (7) discovery of the opposed images of strategy complexity gains brought about by the differing perspectives of intra-individual and comparative judgments, which remains a problem needing resolution; (8) the differing factors affecting art and creative personality, their mutual dependencies and differences; (9) the clarity of "expected" directions in the major experiment, these directions having come from the general theoretical base of internal locus of evaluation, process emphasis and feedback, and supportive and empathic interaction; (10) the greater clarity of the most abstract variable, the within strategy art dependent variable, as a reflector of gains in art which is less value laden than the aesthetic quality judgment but does not thus necessarily replace it; (11) the increased sensitivity coming from period to period analyses of experimental effects and from plotting curves of change, or dynamics; and, finally, (12) the first effort at connecting findings from the major experiment to a teaching-learning experiment where more delineation of teacher functions and interactions was represented in treatment factors.

The initial self-reflective, cyclical reformulative learning model seems to have been fruitful, in retrospect. In like manner, the separation of studio and evaluation phases, the relatively invariant experimental frame, and the value neutral field for experimentation all seem to be constructs of further utility. While this theory has not been compared with any other, it has, nevertheless, been demonstrated that differences in self-reflective conditions and teacher functions within the experiments themselves do cause significant differences in art quality, strategy complexity, and variables in the creative personality domain.

The major experiment now points, through its findings, to a further refinement of the theory it came from. Field testing and application evaluation are possible directions from the reconstructed base. More promising to the author, however, is the effort suggested to move still further into the nature of learning and change in art for still greater elaboration of theory. The generality of findings needs to be studied where sex, age, and art experience, as well as strategy classification are controlled. A beginning effort of the author's with students who are not majors in the arts suggests inconclusively the relevance of the general theory and findings for such students, and the possibility that a constant stimulus and a prescribed evaluation form may not be needed.

Many methodological and experimental questions await further study. The plateaus and curves for period to period changes suggest that "dynamic" treatment variables might be feasible--that is, independent variables that change in intensity, form, or some other way, by conscious intent, over time. Another question has to do with the combinatory influence of treatments which, of necessity, were presented singly in first experiments. It is likely, for example, that interactive setting and independent setting for evaluation are both valuable or, at least, differently effective in combination; or that sustaining and entry questions are both useful, etc. There is apparently no graceful way to get from single to compound effects except through new experimentation. Further delineation of process feedback is suggested. How "iconic," for example, or abstract or "denatured" should it be? Questions about the constant stimulus arise. What about differing versions of still-life arrangments? Is a stimulus needed at all, or would it be as well to have subjects choose a theme of their own? Must the medium remain constant for all subjects, or could choice of stimulus and medium be more closely related to individual differences of subjects--especially to strategy differences? What factors bring about a change of strategy in a subject? Such change did not appear to be directly tied to treatment variables. Finally, why did different strategy gains come about as a result of the differing perspectives of intra-individual and comparative art judgments?

Surely more questions than these arise. They are limited only by the imagination and experiences of the questioner. Suffice it to say that one criterion for evaluating such a research activity resides in the kinds of questions and the increased precision of questions it leads to. Many, but not all, advantages and limitations of this study are apparent to the author. And many of the findings exciting to the author and his co-workers were unforeseen at the start of the research.

The general corroboration of predicted "good" practices as read through outcomes on art and creative personality is encouraging. The specificity and laboratory-like nature of the experiment should not be overlooked in accepting these. In like fashion, the discovery of coherent art strategies and of some of their abstract properties, along with knowledge on what affects them, suggests a new look at practices where one set of values or one working method is encouraged. In contradiction, the conditions describing strategy mobility are not understood, and apparently a quarter to a third of the subjects change strategies over a month's time. The etiology and dynamics of strategies in art thus need study.

The subjective base of art production is underscored by outcomes of this report. Yet, the orderly hierarchies of procedures and goals attributable to the strategies suggests that within the historical, idiographic base can be seen abstract thinking, cognitive order, and image-making regularities capable of further general description. It is to this further task that these findings and this first effort at an empirically based theory beckons. A good theory of learning in art must, further, be open to reformulation upon self-reflective feedback of its own first output, a task suggesting some "delay" and new "plans," generated from corrections in the "image."

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APPENDIX A: Differential Art Criteria: Judge Reliabilities, Intercorrelations within and between Domains, and Factor Analysis

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TABLE XXIX

Intercorrelations
Original Spontaneity, Formal and Divergency Domains

Spontaneity

	1	2	3	4	5	6	7	8
1. Detail: loose-meticulous		.79	.70	.67	.85	.70	.89	.89
2. Media overlap			.79	.82	.88	.78	.96	.92
3. Border of shapes				.90	.67	.55	.86	.73
4. Texture					.69	.52	.86	.78
5. Movement within shapes						.70	.91	.88
6. Objects: moving to still							.78	.77
7. Total								.95
8. Global								

Formal

	1	2	3	4	5	6	7
1. Overlap-transparency		.73	.82	.14	.16	.90	.75
2. Progressive abstraction			.73	.28	.45	.90	.91
3. Connectedness				.29	.33	.89	.81
4. Volume					.13	.28	.45
5. Dominance-Subordination						.33	.41
6. Total							.91
7. Global							

Divergency

	1	2	3	4	5	6
1. Alteration of viewpoints		.63	-.09	-.09	.90	.49
2. Rearrangements			.01	.03	.81	.27
3. Alteration of treatments				-.07	-.12	.16
4. New objects					-.01	.48
5. Total						.41
6. Global						

TABLE XXX

Intercorrelations
Original Spontaneity Domain with Formal and Divergent Domains

	Formal							Divergent					
	Overlap-transparency	Progressive abstraction	Connectedness	Volume 3-D	Dominance-Subordination	Total	Global	Alteration of viewpoints	Rearrangements	Alteration of treatments	New Objects	Total	Global
Spontaneity	1	2	3	4	5	6	7	1	2	3	4	5	6
1. Detail: loose-meticulous	.31	.53	.14	.20	-.18	.30	.39	-.23	-.21	.51	.12	.07	.37
2. Media overlap	.15	.28	.07	.27	-.28	.17	.23	-.18	-.09	.60	.00	.11	.22
3. Border of shapes	.18	.38	.12	.50	-.14	.31	.40	-.09	.04	.66	.02	.23	.25
4. Texture	.14	.38	.15	.60	-.18	.34	.37	-.11	-.04	.73	-.04	.17	.35
5. Movement within shapes	.26	.29	.07	.19	-.39	.13	.22	-.31	-.20	.59	.06	.03	.22
6. Objects: moving-still	.29	.32	.18	.19	-.19	.32	.29	.00	-.16	.36	.11	.25	.47
7. Total	.25	.40	.05	.33	-.27	.27	.34	-.19	-.14	.64	.05	.12	.29
8. Global	.17	.38	-.02	.20	-.24	.19	.27	-.14	-.09	.53	.15	.19	.36

TABLE XXXI

Intercorrelations
Original Formal Domain with Divergent Domain

	Alteration of viewpoints	Rearrangements	Alteration of treatments	New objects	Total	Global
FORMAL						
1. Overlap-transparency	.02	-.28	.37	-.22	-.10	.33
2. Progressive abstraction	.28	-.12	.37	-.25	.06	.51
3. Connectedness	.31	-.20	.22	-.40	-.10	.27
4. Volume 3-D	.20	.19	.61	-.32	.18	.09
5. Dominance-Subordination	.70	-.19	.46	-.21	.29	.50
6. Total	.43	.02	.36	-.38	.09	.50
7. Global	.25	-.11	.34	-.37	-.05	.41

TABLE XXXII

Factor Analysis
Original Differential Criteria

	Factor 1 SPONTANEITY	Factor 2 FORMAL	Factor 3 DIVERGENT
SPONTANEITY			
1. Detail; loose-meticulous	.864	-.190	-.138
2. Media overlap	.944	-.017	-.119
3. Border of shapes	.846	-.116	.012
4. Texture	.842	-.136	-.058
5. Movement within shapes	.878	-.057	-.267
6. Objects; moving to still	.820	-.102	.160
FORMAL			
1. Overlap-transparency	.178	-.869	-.074
2. Progressive abstraction	.345	-.827	.247
3. Connectedness	-.028	-.931	.120
4. Volume 3-D	.350	-.291	.209
5. Dominance-Subordination	-.230	-.336	.801
DIVERGENT			
1. Alteration of viewpoints	-.108	-.145	.898
2. Rearrangements	-.008	.305	.799
3. Alteration of treatments	.649	-.255	-.075
4. New objects	.179	.492	.074

TABLE XXXIII

Inter-Judge Correlations
Revised Differential Criteria

	JUDGES									
	A-B	A-C	A-D	A-E	B-C	B-D	B-E	C-D	C-E	D-E
A. SPONTANEITY:										
1. Detail; loose-meticulous	.77	.77	.86	--	.70	.78	--	.88	--	--
2. Media overlap	.86	.82	.79	--	.87	.80	--	.80	--	--
3. Border of shapes	.53	.62	.60	.60	.82	.77	.62	.82	.64	.66
4. Texture	.83	.75	.69	.68	.76	.78	.69	.85	.83	.74
5. Movement within shapes	.64	.81	.71	--	.77	.75	--	.77	--	--
6. Objects; moving to still	.67	.83	.69	.62	.68	.75	.64	.75	.60	.62
B. FORMAL:										
1. Overlap-transparency	.62	.59	.47	.51	.79	.72	.76	.86	.91	.74
2. Progressive abstraction	.82	.79	.78	.79	.84	.87	.78	.96	.82	.78
3. Connectedness	.83	.71	.78	.62	.66	.74	.55	.76	.74	.75
C. DIVERGENT:										
1. Dominance-Subordination	.79	.71	.53	.85	.77	.68	.70	.64	.67	.63
2. Alteration of viewpoint	.40	.69	.67	.47	.55	.55	.35	.63	.39	.67
3. Rearrangement	.69	.70	.55	.53	.68	.68	.53	.56	.61	.71
D. GLOBAL JUDGMENTS:										
1. Spontaneity	.64	.66	.63	.52	.72	.80	.73	.80	.50	.62
2. Formal	.74	.84	.79	.77	.77	.84	.75	.77	.84	.74
3. Divergent	.51	.65	.66	.54	.66	.62	.50	.59	.50	.48

TABLE XXXIV

Intercorrelations
The Three Revised Domains

		SPONTANEITY								FORMAL					DIVERGENT				
		1	2	3	4	5	6	7	8	1	2	3	4	5	1	2	3	4	5
SPONTANEITY	1. Detail; loose–meticulous		79	70	67	85	70	89	89	31	53	13	38	39	-18	-23	-20	-24	37
	2. Media overlap			79	82	88	78	96	92	15	28	06	23	23	-28	-18	-09	-22	22
	3. Border of shapes				90	67	55	86	73	19	38	12	26	40	-14	-09	04	-08	25
	4. Texture					69	52	86	78	14	38	15	28	37	-18	-11	-04	-14	17
	5. Movement within shapes						70	91	88	26	28	07	26	22	-39	-31	-20	-36	22
	6. Objects; moving to still							78	77	29	32	18	29	29	-19	00	-16	02	47
	7. Total								95	25	40	05	31	33	-27	-19	-14	-24	-29
	8. Global									16	38	-02	26	27	-24	-14	-08	-18	36
FORMAL	1. Overlap–transparency										73	82	90	75	12	02	-28	-05	32
	2. Progressive abstraction											71	90	91	45	29	-11	25	51
	3. Connectedness												89	81	33	31	-17	17	27
	4. Total													91	32	21	-19	14	41
	5. Global														41	25	-11	21	41
DIVERGENT	1. Alteration of viewpoints															70	46	85	50
	2. Rearrangements																63	90	49
	3. Dominance–Subordination																	81	27
	4. Total																		50
	5. Global																		

TABLE XXXV

Intercorrelations
Global Aesthetic with Three Revised Domains

		GLOBAL AESTHETIC
SPONTANEITY	1. Detail; loose-meticulous	58
	2. Media overlap	49
	3. Border of shapes	49
	4. Texture	50
	5. Movement within shapes	47
	6. Objects; moving to still	55
	7. Total	56
	8. Global	46
FORMAL	1. Overlap-transparency	77
	2. Progressive abstraction	82
	3. Connectedness	72
	4. Total	86
	5. Global	86
DIVERGENT	1. Alteration of viewpoints	22
	2. Rearrangements	05
	3. Dominance-Subordination	-22
	4. Total	01
	5. Global	41
	Combined Totals Spontaneity, Formal and Divergent	80

TABLE XXXVI

Differential Judgments on Multiple Purpose Drawing Exercise Intercorrelations of Total Judge Team (3) on Comparative Global Judgments for Juniors

N=48

Pre Test

	Aesthetic Quality	Spontaneity	Divergency
Spontaneity	.509		
Divergency	.497	.318	
Formal	.752	.226	.578

Post Test

	Aesthetic Quality	Spontaneity	Divergency
Spontaneity	.698		
Divergency	.502	.252	
Formal	.731	.166	.656

Pre-Post Correlations

Aesthetic Quality	.649
Spontaneity	.486
Divergency	.698
Formal	.696

TABLE XXXVII

Differential Judgments on Multiple Purpose Drawing Exercise Intercorrelations of Pre Test MPDE Global Judgments to Beginning Period (Uninfluenced) Comparative Judgments for Juniors

N=48

	MPDE			
	Aesthetic Quality	Spontaneity	Divergency	Formal
Aesthetic Quality	.534	.364	.470	.641
Spontaneity	.291	.320	.222	.211
Divergency	-.082	-.307	.093	.139

APPENDIX B: Descriptions of Test Battery from Which Were Chosen the Variables Representing the Capacity for Creative Action

1. Multiple Purpose Drawing Exercise (MPDE) or Drawing Behavior Samples Test (DBS)

This test was developed by Nitschke (55) and is fully described in the reference cited. It has been generally described in Chapters II and III of this report. Examples of one of the stimuli and of sequences of drawings made by students in this study are shown in Figure 1, page 27, and Figure 2, page 31.

2. Art Evaluation Task

Description. This is, in reality, a performance in evaluating in which the student is asked to: (1) describe as many different criteria as possible that will order eight pictorial samples and indicate the order for each; (2) compare the sample of the eight most like a similar drawing of his own. Since the samples have known orders from consensual validation of judges according to a variety of criteria, scores are derived for: (1) Insight in Evaluative Matching, in which criterion orders described by the student are compared with the profile of the sample the student judges most like his own, and (2) the student's ability to recognize the Divergent dimension in the eight samples. The number of criteria produced by the student also constitutes a score. (Developed by Beittel.)

The 8 pictorial samples were drawing sequences from Nitschke's Multiple Purpose Drawing Exercise (MPDE) or Drawing Behavior Sample Test (DBS). (See reference 55)

Example of Task (with Instructions).

Drawing Sequence Evaluation Exercise: Part I.

The purposes of this exercise is to give you an opportunity to order and re-order a set of typical drawings or sketches developed from a visual stimulus. The ordering is to be done in terms of any quality you perceive in the 8 samples, which can be used to order the strips from high to low in that quality. Your goal is to perceive as many different qualities as possible which make as many different orders as possible. Use your own words or descriptions for each principle for ranking the 8 strips. You will be given 10 minutes for this part of the exercise. Sort the 8 strips on each principle or quality. Write the name of the quality to the left of the boxes for each order and enter the pictures, from high to low in order, in the boxes by their identifying letters.

Principle or Quality Observed	Order: (Enter letters in boxes)							
	Highest							Lowest
1. ____________________								
2. ____________________								
3. ____________________								

etc., (space for 10 criteria was provided.)

3. ISSD or Test of Ideational and Social Self-Determination (Form ISSD-63).

This is a test which has gone through three revisions and has proven useful in the description of creative action (see 10). There are four scales: (1) Complexity, (2) Theoretical Interest, (3) Aesthetic Interest, and (4) Social Self-Determination. A completely new set of items was drawn up by Burkhart and Beittel for the Social Self-Determination Scale in an effort to remove response set imbalance which may have resulted from earlier keys which were all keyed "F" or "False."

Burkhart and Bernheim carried out scaling studies, as part of this project, on all keys, using the Guttman system of scale analysis. Population samples were drawn from art and art education undergraduate majors and non art majors from Central Michigan University, Indiana (Pennsylvania) State College, and The Pennsylvania State University.

A complete manual, with all items and keys on all scales, giving a complete history of uses of the test, was drawn up by Burkhart and Bernheim as part of this project and is available from the author at the Department of Art Education, The Pennsylvania State University. See references 5, 10, 16, and 25.

Instructions

The intent of this questionnaire is to give you a chance to describe yourself through your ideas, opinions, and feelings. The questions exist to simplify the task of self-description. This is not a test in the usual sense of the word; it is merely a method of obtaining and organizing information so that your individuality can be understood. We hope you will find this an interesting experience.

You have all the time you want, but it is not advisable to take too much for individual questions. If you cannot decide, guess. Do this for every statement. REMEMBER, no response is either right or wrong. It is YOUR OWN FEELING that should guide you.

Examples of Items

1. I do not like unexpected reactions in others.
2. I would like to hold a glass marble to my eye and see the world transformed.
3. Success is a result of insight, often with a minimum of information.
4. Theoretical discussions are too much like arguments to make me feel natural.
5. I enjoy group activities.
6. I do not like people who do things to test other's reactions.
7. The sounds of a big city grate on my nerves.
8. I am willing to pursue an idea no matter where it may lead.
9. I am interested in the historical changes and developments in American jazz.
10. Many worthwhile things in the world are accomplished by the little men who do what they are supposed to do, unimportant as their jobs may seem.

etc.

Items were answered "T" or "F" on IBM sheets. There are 124 items in ISSD-63. (Test developed by Burkhart.)

4. BBCI-X3 or Experimental Creativity Inventory

This is the third version of the BBCI series. There are 130 items, with 14 "content" scales. These are named: (1) Originality, (2) General Sensitivity, (3) Flexibility, (4) Interest, (5) Independence, (6) Action, (7) Abstraction from Perception, (7) Inclusion of Opposite, (8) Confidence (Risk), (9) Humor, (10) Fluency, (11) Tension, (12) Supportive Environment, (13) Skill, and (14) Creative Orientation (Word Pairs). Several items of this test attempt to take over the self-rating function found valuable as a predictor of art criteria in earlier studies (see 10, 22). A total score on scales 1 through 13, above, was named Creative Independence and used as a dependent variable in this report. See references 5, 6, and 10.

In the construction of this test an effort was made to cover as many dimensions of testing as possible, basing this goal on findings from criterion-predictor studies in art. The somewhat cumbersome scoring instructions and procedures described below have proven useful in absorbing a portion of the subject's attention which might otherwise focus on social desirability or other response set factors. Scales were constructed with equal numbers of "T" and "F" items. (Developed by Beittel and H. J. Burgart.)

General Instructions

The intent of this questionnaire is to give you a chance to describe yourself as *you* see yourself. The questions exist to simplify the task of self-description. This is *not* a test in the usual sense of the word; it is merely a method of obtaining and organizing information so that your individuality can be understood. We hope you will find this an interesting experience.

The directions are different for Part I and Part II. Please read carefully. You have all the time you want, but it is not advisable to take too much for individual questions.

Part I Answering Instructions

A = agree B = disagree	1. Blacken column 1 if you agree with A and disagree with B.
A = agree B = disagree	2. Blacken column 2 if you agree with both A and B.
A = disagree B = disagree	3. Blacken column 3 if you disagree with both A and B.
A = disagree B = agree	4. Blacken column 4 if you disagree with A and agree with B.

Examples of Items, Part I

29. A. I would not be considered an active person when compared to others of my age and interests.
    B. I cannot nurse ideas along over long periods of time without having them go stale.

30. A. I doubt whether I could write out in five minutes thirty different uses for "a brick."
    B. I often get vague but powerful feelings that compel me to find a form for their expression.

31. A. I scarcely recall a time when I have not had some exciting or pressing personal project to work on.
    B. I would not consider my ideas especially clever in comparison to those of others of my age and interest.

32. A. I see humor where other people never do.
    B. I am not quick to get the feel of a new tool.

33. A. A different sound, sight or texture often sets off intricate thoughts in me.
    B. I rarely feel that I am "destined" to achieve great things.

34. A. I think that poetry, music and art are all right, but they don't get the world's work done.
    B. I can see humor in the most serious of situations.

35. A. Fate has kept me from being what I would call a "creative" person.
    B. For me, resignation is often a new path to action.

36. A. I rarely become interested in something to such an extent that I can forget food and sleep.
    B. I often begin a task before any official approval is given.

37. A. Things rarely seem to be arranging themselves for my special advantage.
    B. I can't understand how Proust could recall his childhood from the taste of a cookie.

etc.

(There are 50 such two part items in Part I.)

Instructions for Part II

In each of the items 51 through 80, you will be presented with a pair of words (or phrases in several cases). Choose one of the words (or phrases) in each pair purely on the basis of their appeal to you. Indicate your preference by blackening column 1 on the IBM sheet (opposite the item number) if you select choice (1), or column 2 if you select choice (2). Do not spend a long time on each pair. Remember, always make one choice.

Examples of Items, Part II

58. Diffusion is: (1) an abstract state (2) the mixing of liquids

59. (1) prejudiced (2) reckless

60. (1) unplanned (2) scheduled

61. (1) process (2) technique

62. (1) changeable (2) cautious

63. A paper clip is: (1) an involuted form (2) for holding paper

64. (1) statement (2) percept

65. (1) adaptable (2) precise

66. (1) meadowlark (2) eagle

67. (1) systematic (2) spontaneous

68. A calendar is: (1) a linkage with eternity (2) a daily guide

69. (1) rebellious (2) mannerly

etc.

(There are 30 such two part items in Part II.)

5. FAT or Flexibility and Abstract Orientation Test.

A test of 80 items, 40 of which are of the self-descriptive statement type, 40 of which are word pairs. The statements reflect an action orientation typified by spontaneous flexibility, whereas the word pairs reflect a preference for abstract over concrete words. This test was developed specifically for this project in an effort to capitalize on prior art criterion-personality predictor studies (see reference 10 and 25). (Developed by Beittel, Burkhart, and H. J. Burgart.)

Instructions

DIRECTIONS: Below you will find interspersed items and word pairs. When you read an item, if you agree or mostly agree with it, blacken the first column of your IBM answer sheet. If you disagree or mostly disagree with an item, blacken the second column of your IBM answer sheet.

When you come to the word pairs, choose one on the basis of its appeal to you. If you choose the first or "A" word, blacken the first column of your IBM sheet for that item. If you choose the second or "B" word, blacken the second column of your IBM sheet.

Do not spend too much time on any one statement or word pair. Your first response is usually the best for you. It is important that you respond with your true feelings rather than how you would like to feel or think.

Examples of Items

56. a. vital b. successful

57. I dislike working with people who are too disorganized.

58. a. solution b. divergent

59. I like problems that have more than one possible solution.

60. a. impulsive b. careful

61. In writing an essay exam I usually begin writing and organize as I go rather than plan my answer in detail beforehand.

62. a. competent b. inspired

63. I prefer houses in which the furniture is all from one period.

64. a. process b. technique

65. I enjoy solving problems without using the more obvious methods.

etc.

(There are 80 such items.)

6. OQT or Object Question or Divergent Question Test

This is a timed test in which the respondent is to ask "open" questions about common objects, such as "ice." The questions are to arouse interest and curiosity and lead to a variety of responses which are neither factual nor capable of a "yes-no" answer.

A new scoring rationale was developed by Burkhart and Bernheim during this project, along with a manual which describes question categories and scoring systems. In addition, past performances on the test are cited. (The manual is available through the Department of Art Education, The Pennsylvania State University.) See references 6 and 25. Recent uses of the test were reported by Getzels (32) and by Torrance (personal communication). (Developed by Burkhart.)

Instructions

In this measure you will first be given the name of an object. You are to think of as many questions as you can about this object. These questions should lead to a variety of different answers which might arouse the curiosity and interest of others concerning this object.

EXAMPLE:

OBJECT: APPLE

QUESTIONS:

1. Why do you think God chose the apple rather than another fruit with which to tempt Eve?

NOTE: This would be a good question because it would lead to a variety of responses from others. But the question, "Do all apples have seeds?" would be unsatisfactory as it leads to only a right or wrong answer.

On the following pages you will find the names of six things.

You will have for each object 1-1/2 minutes to write as many questions as you are able.

7. SDT or Word Selection Preference Patterns Test

A 42 item test in which five words are presented to the subject on each item. As in the VM, which follows, the respondent is asked to choose only two. The five words represent a priori choices originally labeled: (1) abstract orientation, (2) process orientation, (3) theory orientation, (4) impulsivity orientation, and (5) non-conventionality orientation. New scales were developed for this test during the first part of this project. The method of presenting 5 dimensions consistently and requiring only 2 choices was to get at a subject's hierarchy of values in terms of these dimensions. See references 5, 10, and 25. (Developed by Beittel and Burkhart.)

Instructions

On the basis of their appeal to you, choose two words in each five word group below. Blacken, with an IBM pencil, the two IBM spaces corresponding to the letters of the two words you have chosen. Remember to pick no less, and no more, than two words for each five word item, and choose purely on the basis of your subjective preference.

Example of Items

1.
    1. Intuitive
    2. Concept
    3. Changeable
    4. Sociable
    5. Logical
2.
    1. Excitable
    2. Courtesty
    3. Complex
    4. Insight
    5. Structured
3.
    1. Credible
    2. Subjective
    3. Respectable
    4. Originate
    5. Thought

etc.

(There are 42 such items.)

8. VM or Visual Magila: An Experimental Exercise for Visual Preference Patterns

This test consists of 32 items, each of which contains five pictures from which two are to be chosen on the basis of preference. The stimulus pictures have the flavor of non-representational process samples in black and white media. Each item has samples representing a Process vs. Control dimension; a Masculine vs. Feminine dimension (Square, Heavy, Bold, Dark, etc., as opposed to Round, Light, Graceful, etc.); and a Unique Organizational dimension. These dimensions are so combined that there is in each item the following types of samples: (1) Process-Feminine, (2) process-Masculine, (3) Control-Feminine, (4) Control-Masculine and (5) Unique Organization. See references 5, 11. (Developed by Beittel.)

Instructions (Examples are not included since faithful pictorial reproduction is required).

On each of the eight pages of this booklet you will find four items of pictures. Each item includes five pictures, numbered 1, 2, 3, 4, 5. Your task is to look at the five pictures for each item carefully and then select two (and only two and no less than two) pictures from each set of five. Make this selection on the basis of the appeal which these pictures hold for you. This is the only basis for selection required--your personal interest or attraction to them.

The items are numbered from 1 to 32. The item number appears in the black band to the left of each strip of five pictures. Make your selection by blackening the appropriate lines on your IBM answer sheet. Each picture is marked with a 1, 2, 3, 4, or 5 in its lower left corner. These numbers correspond to answer columns on the IBM answer sheet.

There is no time limit. Proceed at your own rate of speed.

9. Process Involvement Recall from Product Stimulus

There is an A and B form of this checklist on each of which 50 adjectives descriptive of process feelings and thoughts are presented for checking through recall on the student's part, with his art object before him. The items are treated like bi-polar scales in Osgood's semantic differential (56). See reference 64. (Developed by Bernard Schwartz).

Instructions (Form A)

On the following pages you will find items composed of pairs of words. Read each pair of words and decide which one of the pair best expresses YOUR FEELINGS AND THOUGHTS as you are working on your art project.

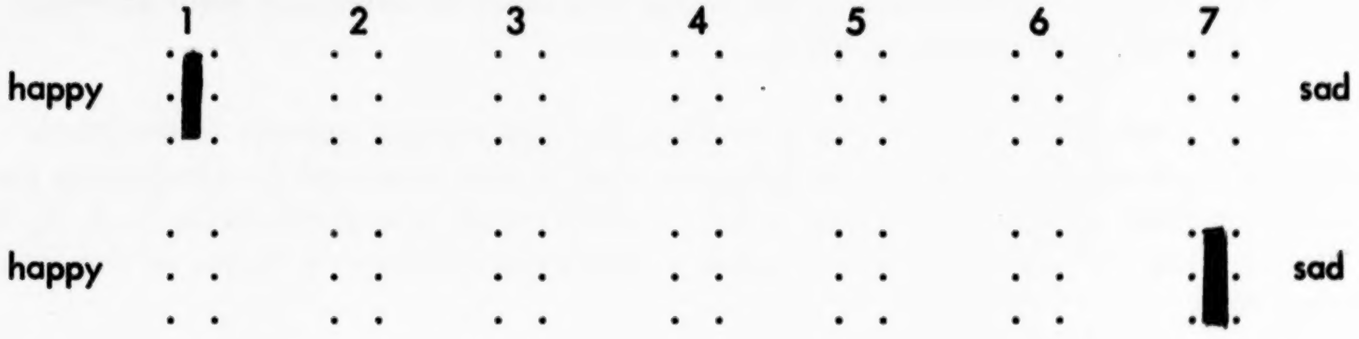
The purpose of this report is to help us to determine the effectiveness of this art experience, and you can best help by being honest and frank.

Do not be concerned about duplications, contradictions, and so forth. Check only those words which best describe you as you really are as you work, not as you would like yourself to be as you work.

Example of Use of Answer Sheet:

Consider the pair of words: happy -- sad

If you VERY CLOSELY AGREE that your feelings and thoughts are best expressed by either the words "happy" or "sad", then blacken the space at one or the other end of the scale as follows:



IMPORTANT: (1) Be sure to indicate your agreement to either the first or the second word of each word-pair, or to indicate a NEUTRAL if appropriate.

(2) Do not skip any pair.

(3) Never blacken more than one space for each scale on your IBM Score Sheet.

Work at a fairly high speed and do not worry about individual items. It is your first and immediate impression about the items that we want. On the other hand, please do not be careless, because we want your true impressions.

Example of Items

4. capable - inept
5. expanded - contracted
6. impetuous - patient
7. rigid - flexible
8. rash - cautious
9. dynamic - static
10. eager - apathetic
29. creative - uncreative
30. delicate - rugged
31. effortless - labored
32. decisive - indecisive
33. changeable - fixed
34. bold - timid
35. versatile - constant

etc.

(Fifty such items are presented.)

Form B

The same format is used, but with differing instructions. One half the items are in common for both forms, the other half are peculiar to the specific form.

Instructions for Form B

On the following pages you will find items composed of pairs of words. CAREFULLY STUDY YOUR ART WORK at its present state, then read each pair of words and decide which one of the pair best describes the CHARACTERISTICS AND QUALITIES EVIDENT IN YOUR ART WORK.

The purpose of this report is to help you to make a meaningful and personal SELF-EVALUATION OF YOUR ART WORK IN PROGRESS, and you can best help by being honest and frank in your responses.

Do not be concerned about duplications, contradictions, and so forth. Do not look back and forth through your responses in FORM A or try to remember how you checked similar items earlier because FORM A and FORM B serve different purposes. Check only those words which best describe the characteristics and qualities really evident in your art work, not those which you would like the art work to have.

10. WET or Word Equation Test

This is a power test asking the student to find a common denominator or principle which will order three words (e.g., floor, chair, ceiling) and give an explanation for doing so. The student is asked to give as many common denominators within a given time period as possible. This test was newly developed for this project to get at abstract thinking power and cognitive flexibility. (Developed by Burkhart.)

Instructions

In the following test, you will be given various groups of three words and asked to submit possible solutions to the word equations in which the three words are included. You will be presented first with a word equation which has been solved, for example:

Equation:		Common Denominator:	Explanation:
Clouds			free moving (Most)
Trees	=	movement	limited swaying (Some)
Ground			relatively static (Least)

Note that an order of value exists from most to some to least. This constitutes a hierarchy with the extreme being the top word. You will be presented with six equations using the same words but in different combinations, and you are to arrive at a new common denominator and set up your own explanation for each, for example:

Equation:		Common Denominator:	Explanation:	
Ground			largest	(Mos
Clouds	=	size	smaller than earth	(Som
Trees			smaller than clouds	(Leas

You will not be given a score for any solved equation in which you have duplicated any common denominator used in the examples or any which you have listed in any other equation throughout the entire test. In other words, every common denominator you use must represent a new one or it will not be scored. Do not expect to find common denominators for all equations - you will do better on this test if you work quickly not spending too much time on any equation.

Should you complete a page before the allotted time has expired or have temporarily exhausted your thinking concerning a set of word equations, you may turn back and work on the previous sets of word equations - but do not advance to the next page until the tester tells you to do so. You will be allowed six minutes for each page of word equations.

Example of a Test Page (There are 5 such pages. Note that all 6 orders of the 3 stimulus words appear.)

Example:

Equation:		Common Denominator:	Explanation:	
Paper			$\frac{1}{1000}$ inch	(Most
Board	=	thinness	3/4 inch	(Some
Brick			3 inch	(Least

Paper			
Board	=		
Brick			

Paper			
Brick	=		
Board			

etc.

11. PIT or Process Independence and Self-Reliance Test

This is a test which presents to the student on each item five statements representing decisions or attitudes concerning independent work and the working process, and asks the student to rank these. This test was developed by a graduate student in a research seminar during this project. (Developed by Penny Burkhart.)

Instructions

Complete the statements by ranking the following solutions (a-b-c-d-e) according to your personal preference from 1, most preferred, to 5, least preferred, placing the numbers in the appropriate boxes at the right. Each rank, 1, 2, 3, 4, and 5, should appear once for each item.

Examples of Test Items

13. When no one responds positively or negatively to a piece of art work which I made and I think is good:

    a. I try another idea which is similar. a. ☐
    b. I pursue the idea again and again anyway regardless. b. ☐
    c. I try to bring new meaning to the same idea. c. ☐
    d. I look at it anew and try to evaluate it myself objectively. d. ☐
    e. I toss it out. e. ☐

14. After working alone for a long period of time I find I need to interact verbally and ideationally with others because:

    a. it helps me solve my problems with my work. a. ☐
    b. I center too much on myself and get stale. b. ☐
    c. I enjoy a good brisk argument about ideas every once in a while. c. ☐
    d. it helps me get a clearer picture of myself. d. ☐
    e. I find a change of environment helpful. e. ☐

etc.

(There are 16 such items.)

12. RAT or Remote Associates Test

This is a test in which three words are presented in each item and the respondent is asked to discover a word which "mediates" a common association among them. An example is: blue, cottage, rat; which words can be mediated by the remote associate "cottage." There are 40 such items. This is a copyrighted test designed by Sarnoff and Martha Mednick of Michigan State University. It was used by permission of the authors. See reference 51.

APPENDIX C: Comparative or External Art Dependent Variables: Intercorrelations, Judge Reliabilities, Means and Standard Deviations

TABLE XXXVIII

Comparative or External Judgments
Intercorrelations of Judges on Aesthetic Quality Judgment
N=384

	Average r with Spontaneous Judge Team (3)	Average r with Divergent Judge Team (3)	Average r with Total Judge Team (6)
Spontaneous Judges (3) (average intercorrelations =.418)	.779	.506	.720
Divergent Judges (3) (average intercorrelations =.382)	.492	.765	.684
Total Judges (6) (average intercorrelations =.401)	.636	.636	.702

(All correlations significant at .01 level)

TABLE XXXIX

Comparative or External Judgments
Intercorrelations of Judges on Spontaneity Judgment
N=384

	Average r with Spontaneous Judge Team (3)	Average r with Divergent Judge Team (3)	Average r with Total Judge Team (6)
Spontaneous Judges (3) (average intercorrelations =.655)	.877	.756	.848
Divergent Judges (3) (average intercorrelations =.694)	.775	.886	.861
Total Judges (6) (average intercorrelations =.675)	.821	.821	.855

TABLE XL

Comparative or External Judgments
Intercorrelations of Judges on Divergency Judgment
N=384

	Average r with Spontaneous Judge Team (3)	Average r with Divergent Judge Team (3)	Average r with Total Judge Team (6)
Spontaneous Judges (3) (average intercorrelation =.386)	.768	.644	.730
Divergent Judges (3) (average intercorrelation=.684)	.717	.841	.806
Total Judges (6) (average intercorrelation =.535)	.740	.743	.768

TABLE XLI

Comparative or External Judgments
Summary of Means and Standard Deviations for Judge Subgroups and Total Judges
N=384

	Spontaneous Judge Team (3)		Divergent Judge Team (3)		Total Judge Team (6)	
	Average Mean	Average S.D.	Average Mean	Average S.D.	Average Mean	Average S.D.
Aesthetic Quality Judgment	4.644	2.580	4.410	2.274	4.535	2.434
Spontaneous Judgment	4.278	2.446	4.452	2.372	4.377	2.416
Divergent Judgment	5.140	2.452	5.244	2.366	5.189	2.409

TABLE XLII

Comparative or External Judgments
Intercorrelations of Judge Groupings by Judgments

N=384

Aesthetic Quality Judgment

	Spontaneous Judge Team (3)	Divergent Judge Team (3)
Divergent Judge Team (3)	.642	
Total Judge Team (6)	.915	.894

Spontaneity Judgment

	Spontaneous Judge Team (3)	Divergent Judge Team (3)
Divergent Judge Team (3)	.869	
Total Judge Team (6)	.967	.966

Divergent Judgment

	Spontaneous Judge Team (3)	Divergent Judge Team (3)
Divergent Judge Team (3)	.837	
Total Judge Team (6)	.949	.957

TABLE XLIII

Comparative or External Judgments
Intercorrelations of Judgments by Judge Groupings

N=384

Total Judge Team (6)

	Aesthetic Quality	Spontaneity
Spontaneity	.521	
Divergency	-.012	-.663

Spontaneous Judge Team (3)

	Aesthetic Quality	Spontaneity
Spontaneity	.663	
Divergency	-.119	-.538

Divergent Judge Team (3)

	Aesthetic Quality	Spontaneity
Spontaneity	.225	
Divergency	.139	-.718

TABLE XLIV

Comparative or External Judgments
Means and Standard Deviations for Judges on Aesthetic Quality Judgment for Beginning Period and Three Treatment Periods

N=96 for Each Period

	Spontaneous Judge Team (3)		Divergent Judge Team (3)		Total Judge Team (6)	
	Average Mean	Average S.D.	Average Mean	Average S.D.	Average Mean	Average S.D.
Period 1	4.750	2.705	4.003	2.019	4.336	2.345
Period 2	4.500	2.626	4.406	2.355	4.450	2.490
Period 3	4.705	2.624	4.559	2.243	4.613	2.433
Period 4	4.639	2.640	4.688	2.286	4.663	2.470
Period 2, 3 and 4	4.569	2.610	4.505	2.285	4.575	2.448

TABLE XLV

Comparative or External Judgments
Means and Standard Deviations for Junior and Freshman Students on Aesthetic Quality by Judge Groupings

N=384

	Spontaneous Judge Team (3)		Divergent Judge Team (3)		Total Judge Team (6)	
	Average Mean	Average S.D.	Average Mean	Average S.D.	Average Mean	Average S.D.
Juniors: N=192 (4 periods for 48 students)	5.493	2.561	4.842	2.395	5.158	2.478
Freshmen: N=192 (4 periods for 48 students)	3.804	2.285	3.953	2.097	3.893	2.191

Note: The following t tests between means are significant at the .01 level:

1. For Spontaneous Judge Team: between Junior-Freshman Means
2. For Divergent Judge Team: between Junior-Freshman Means
3. For Total Judge Team: between Junior-Freshman Means
4. For Juniors: between Spontaneous Judge Team and Divergent Judge Team Means

TABLE XLVI

Relationship of Intra-Individual or Internal Strategy Complexity Judgment[1] for Spontaneous Students to Comparative or External Spontaneity Judgments[2] for the Four Experimental Periods

	Spontaneous Judge Team (3)	Divergent Judge Team (3)	Total Judge Team (6)
		N=45	
Period 1	.303	.313	.317
Period 2	.380	.515	.459
Period 3	.482	.374	.450
Period 4	.530	.559	.559
		(N=180)	
All Periods	.419	.439	.444

[1] As judged by principal investigator and his research associate.

[2] As judged by 6 man judge team (3 "Spontaneous" and 3 "Divergent" expert judges)

Note: Since the Intra-Individual or Internal Strategy Complexity Judgment is a "Gains" Judgment in which periods 2 to 4 (treatment influenced) are compared to period 1 (non-influenced base), it is expected that correlations with Comparative or External Spontaneity Judgments will rise after period 1.

TABLE XLVII

Relationship of Intra-Individual or Internal Strategy Complexity Judgment[1] for Divergent Students to Comparative or External Divergency Judgments[2] for the Four Experimental Periods

	Spontaneous Judge Team (3)	Divergent Judge Team (3)	Total Judge Team (6)
		N=51	
Period 1	.164	.064	.130
Period 2	.316	.333	.343
Period 3	.531	.524	.562
Period 4	.710	.599	.682
		(N=204)	
All Periods	.414	.367	.414

[1] As judged by principal investigator and his research associate.

[2] As judged by 6 man judge team (3 "Spontaneous" and 3 "Divergent" expert judges)

Note: Since the Intra-Individual or Internal Strategy Complexity Judgment is a "Gains" Judgment in which periods 2 to 4 (treatment influenced) are compared to period 1 (non-influenced base), it is expected that correlations with Comparative or External Divergency Judgments will rise after period 1.

APPENDIX D: Standard Form Used in the Evaluative Sessions of the Major Experiment

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My Research Number: ______________________ Date Today: ____________

List three criteria below by which you will evaluate the pictures.

Rate each picture under each criterion on a five point scale with 5 as high

Criterion One: (Write)	Criterion Two: (Write)	Criterion Three: (Write)

	P1	P2	P3	P4
High 5				
4				
Med 3				
2				
Low 1				

	P1	P2	P3	P4
High 5				
4				
Med 3				
2				
Low 1				

	P1	P2	P3	P4
High 5				
4				
Med. 3				
2				
Low 1				

EXPLANATION OF MY EVALUATION

Why I rated the pictures as I did:

Criterion One:

Criterion Two:

Criterion Three:

PROJECTION FOR GOAL-SETTING

Using the above criteria, I could improve my work by:

Criterion One:

Criterion Two:

Criterion Three:

Subjectively, I feel that my MOTIVATIONAL INTEREST in my learning activity is at the level indicated at the right.

(Circle the appropriate number) High 5 4 3 2 1 Low

Subjectively, I feel that my confidence in my working process was at the level indicated at the right.

(Circle the appropriate number) High 5 4 3 2 1 Low

APPENDIX E: Art Strategies: Factor Analysis of Strategy Complexity Criteria, and Descriptive Information on Spontaneous and Divergent Art Strategies

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TABLE XLVIII

Varimax Rotation of Spontaneous and Divergent Strategy Criteria
Used in Internal or Intra Judgments, Listing Highest Loading of Each Criterion[1]
N=96

F1		F2		F3		F4		F5		F6[2]		F7		F8		F9[3]	
Spontaneous Action		Basic Spontaneous Strategy		Divergent Surface Control		Divergent Single Element		Spontaneous and Divergent Compositional Structure		Basic Divergent Strategy		Spontaneous Erratic Lines		Divergent Progressive Control		Spontaneous Medium Usage	
S14	.621	S10	.799	D21	.688	D1	.746	S16	.795	D5	.718	S15	.778	D16	.746	S8	.734
S13	.604	S5	.690	S6	-.575	D13	.688	D4	-.690	D7	.622			D20	.518	S11	.534
D18	.508	S4	.637	D19	.542	D8	.443	S18	.477	D15	.607					S12	.533
		S7	.560	S17	-.513	S9	.442			D14	.600						
		S2	.513							D17	.578						
		S1	.481							S19	-.567						
		S3	.434							D9	.556						
										D13	.531						
										D10	.529						
										D2	.528						
										D11	.523						
										D3	.430						
										D6	.404						

---

[1] See Tables and for names of Spontaneous and Divergent strategy criteria matching the numbers above.

[2] Correlation between F2 and F6 is -.726.

[3] Correlation between F6 and F9 is -.585.

TABLE XLIX

Art Strategy Criteria (Internal or Intra Art Judgment) Discriminating between Top 48 and Bottom 48 Students as Ordered on Each Strategy Domain

A. Spontaneity

Criterion	Top 48	Bottom	rAQ[1]	rSP[2]	rDV[2]
2 - Space through Voids	11	3	.345	.387	-.050
5 - Direct, Flowing Strokes	15	6	.343	.475	-.227
7 - Incorp. of Acc. Forms	19	10	.239	.783	-.404
12 - Broken Light in Darks	21	14	.217	.587	-.292
15 - Erratic Lines (Reversal)	18	26	-.128	.358	-.298
19 - Relies on Suggestion	35	26	.258	.554	-.463

B. Divergency

			rAQ[1]	rDV[2]	rSP[2]
7 - Black-White Neg. Reversals	21	9	.221	.709	-.379
8 - Edge Tension	21	12	.157	.520	-.296
13 - Single Element Focus	25	14	.157	.453	-.157
18 - Changes Internal Sizes	25	18	.099	.493	-.084
19 - Black-White Contrasts	33	16	.328	.588	-.247
21 - Flatness	38	25	.276	.415	-.231

---

[1] External or Comparative Judgment

[2] Internal or Intra Judgments

TABLE L

Identification of Student Art Strategy[1] from Written Evaluation Forms Utilized in the Experiment (Freshman, N=48)

		Interactive Setting		Independent Setting	
		Self-Discovered	External	Self-Discovered	External
	x	4	5	3	5
Process	y	1	0	1	1
Feedback	z	1	1	2	0
	x	5	3	4	4
Product	y	1	1	0	0
Feedback	z	0	2	2	2

x = correct choice y=wrong choice z= borderline of the two strategies

Note: Where a clear imbalance existed (38 cases), there was 87% accuracy.

---

[1] Identification in this case refers to the Within Strategy or Greater Strategy Gains as determined by the Internal or Intra Judgments.

TABLE LI

Statements Taken From Evaluation Forms of Spontaneous and Divergent Students
(Used in determining thinking strategies.)
(From the Freshman Group)

Divergent

8*
communicate by accident, building
use negative, positive
detail enriches, makes more sensitive

48
can't decide what to do with it
take a section and use it
don't have big, square thing in the middle
change size relationships
move focus point
start smaller

14
use negative, positive
repetition of line
picture expands to the edges
plan more
vary lines

53
unusual viewpoint
find one part with interesting areas
use negative, positive
too simple
use detail, shading
be more careful

43
express definite feeling
see it as it builds
experiment, see what happens
different view
take what emerges as a composition
intensify
use positive, negative

4
discipline yields freedom
new direction
work for finished product

45
experiment, try everything
be free, but be realistic

22
new viewpoint
more definition
use finer lines of separation

35
contrast very important
form controlled by line

33
work looks busy
vary lines more
use positive and negative

47
keep experimenting
find new devices
integrate
off-balance

30
change order of parts
change viewpoint
new experience
definite lines from the beginning

9
sureness promotes freedom
use negative, positive
vary everything

*Number of Student

Divergent (continued)

26
use various angles
rework certain forms
search for new freedoms
experiment

34
approach one form in different ways
change all the structures
realize freedoms

57
go on with one form
stay controlled
add lines for meaning
organize forms more

51
keep adding until one sees something one likes
variation of line, important
change proportions, go into detail

60
experiment
concentration helps freedom
fill more space

14
looks crimped and squeezed
concentrate on one form
achieve new ones by variation
use negative, positive

28
new techniques
lack of confidence
study each object in relationship to the whole and to each other

54
lose rigidity
originality is difficult
try new methods

58
crowded effect
pushed to one side
use positive, negative
vary shapes, placement
line drawing comes first

Spontaneous

11
work larger, looser, bigger strokes
remain flexible
use less definite line

2
suggest much with less, particularly less line
use mass shapes, overlap
free organization, more abstract
form, more nebulous

32
use the whole space at once
good shades within large statements
get more down sooner
big feeling, more successful

46
slopped water on the page
work larger
freedom and experimentation

Spontaneous (continued)

3
freedom, spontaneity, important
splashy ink, good
make the center bring parts together
strengthen unity of parts to whole
use more large, dark areas

5
fast, free
break rules
new procedures
see whole thing at once
work as if it's independent work

12
freedom first, then composition
work faster, wetter
confidence
think more at beginning
keep the whole simple
loosen up, don't concentrate on detail
conclude strong work faster

44
simplicity
clarity of thought
one idea
vagueness in pictures
no unnecessary details

61
do not limit to one part
be bolder
work on the whole

36
start loose, study, do secret things
work quickly, but not sloppy
put new objects in each picture
experiment freely
work fast and direct

APPENDIX F: Predictors of Art Strategy Classification

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TABLE LII

Predictors of Strategy Classification as
Obtained from Internal Art Judgments (Strategy Complexity, Within Strategy)
Freshmen, N = 48

SPONTANEOUS	Pre	Post	DIVERGENT	Pre	Post
Confidence:			Self-Consciousness:		
Complexity In Action - ISSD	.385[1]	.501	Propriety In Behavior - SDT	.-291[1]	.-233
Dot Expansion - Dot Placement[2]	.278		Dot Contraction - Dot Placement	.-302	
Exuberance:			Self-Restraint:		
Exuberance In Behavior - SDT	.266	.473	Self-Restraint - SDT	.-185	.-371
Non-Conventionality:			Outward Conventionality:		
Social Self-Determination - ISSD	.376	.437	Conventionality - SDT	.-287	.-417
Independent Thinking:			Conceptual Flexibility:		
Theory - ISSD	.253	.172	Low Error Speed Printing Ratio - Reversal Rubato[2]	.-388	
Process Pursuit and Directness in Action:			Control In Process, Indirectness In Action:		
Process Plus - SDT	.376	.431	Control In Process - SDT	.-221	.-135
Process Pursuit - SDT	.359	.421	Preconception In Process - SDT	.-231	.-387
Process Tentativeness - VM	.222	.349	Directness In Control - VM	.-185	.-363

---

[1] Positive r's represent Spontaneous end of strategy identification variable; negative r's, the Divergent end.

[2] See footnote, page , for a description of these 2 tests. For a description of the remainder, see Appendix B.

Note the increased r's at post test, suggesting what has been termed "strategy congruence" effect.

TABLE LIII

Multiple Correlation of Pre-Test Verbal Strategy Self-Concept Measures and Visual Preference and Performance Measures with Art Strategy Classification as Obtained by Internal Art Judgments
(Freshmen, N = 48)

	Art Strategy Identification	Within Strategy	Combined Strategy
Verbal Self-Concept Measures			
1. SDT - Word Selection Process Preference (9 variables)	.480**	.424**	.458**
2. ISSD - Ideational and Social Self-Determination (4 variables)	.469**	.300*	.364**
3. BBCI-X3 - Creativity Inventory (7 variables)	.434**	.198	.236*
4. FAT - Spontaneous Flexibility (1 variable)	.194	.032	.020
Visual Preference and Performance Measures			
5. Visual Magila - Process Samples Preferences (3 variables)	.242*	.303*	.265*
6. Reversal Rubato - Reversal Symbol, Writing, and Printing Test (12 variables)[1]	.554**	.556**	.603**
7. Dot Placement - Preference for Expanding or Contracting Configurations (8 variables)	.478**	.476**	.472**
Multiple Correlation, Entire Battery (44 variables)	.986**	.966**	.990**
Verbal Self-Concept Measures Total	.666**	.590**	.619**
Visual Preference and Performance Measures Total	.749**	.693**	.733**

---

[1] See footnore, page , for a description of these 2 tests. For a description of the remainder, see Appendix B.

APPENDIX G: Intercorrelations of Dependent Variables for the Major Experiment

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TABLE LIV

Intercorrelations of Art Dependent Variables (at Post Test)
N=96

	External or Comparative Judgments			Internal or Intra Judgments	
	Aesthetic	Spontaneity	Divergency	In Strategy	Spontaneity
(External)					
Spontaneity	.545				
Divergency	-.016	-.708			
(Internal)					
In Strategy	.529	.195	.282		
Spontaneity	.383	.753	-.563	.315	
Divergency	.133	-.460	.748	.591	-.499

Pre-Post Correlations of External Judgments:

Aesthetic Quality = .750
Spontaneity = .720
Divergency = .551

TABLE LV

Intercorrelations of Dependent Variables Representing the
Capacity for Creative Action (at Post Test)
N=96

	Complexity	Aestheticism	Theory	Social Self-Determination	Originality	Creative Independence	Flexibility	Pre-Post Correlation
Complexity								.747
Aestheticism	.509							.787
Theory	.686	.564						.786
Social Self-Determination	.598	.342	.375					.696
Originality	.360	.174	.485	.281				.634
Creative Independence	.641	.466	.583	.503	.553			.646
Flexibility	.688	.300	.430	.422	.271	.509		.742
Object Question	.248	.251	.189	.068	.001	.282	.167	.873

APPENDIX H: Summaries of Analyses of Variance Utilizing the Differential Art Criteria

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TABLE LVI

Summary of Analyses of Variance[1]
Gains on Differential Art Judgments on the Multiple Purpose Drawing Exercise: Spontaneity Domain
Junior Sample, N=48

Source of Variation[2]	Direction	Objects Moving to Still		Texture		Border of Shapes		Media Overlap		Spontaneity Total	
		F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability	F-Ratio	Probability
A		-----	----	-----	----	-----	----	-----	----	-----	----
B		-----	----	-----	----	-----	----	-----	----	-----	----
C		-----	----	-----	----	-----	----	-----	----	-----	----
AB		-----	----	4.975	.05	3.291	.10	5.115	.05	3.526	.10[3]
AC		-----	----	-----	----	-----	----	-----	----	-----	----
BC		5.341	.05	-----	----	-----	----	-----	----	-----	----
ABC		-----	----	-----	----	-----	----	-----	----	-----	----

---

[1] For method of computation, see footnote on Table LXI, p. 199.

[2] For names of factors A, B, and C consult Table V, p. 43.

[3] A-1, B-1>A-2, B-2>A-2, B-1>A-1, B-2
(9.6) (7.6) (2.8) (-.6)

[4] Two criteria showed no significant F-Ratios:
(1) Movement within Shapes and (2) Detail: Loose-Meticulous

TABLE LVII

Summary of Analyses of Variance[1]
Gains on Differential Art Judgments on the Multiple Purpose Drawing Exercise: Formal Domain
Junior Sample, N=48

Source of Variation[2]	Direction	Connectedness F-Ratio	Connectedness Probability	Progressive Abstraction F-Ratio	Progressive Abstraction Probability	Transparency F-Ratio	Transparency Probability	Overlap F-Ratio	Overlap Probability	Formal Total F-Ratio	Formal Total Probability
A		-----	----	-----	----	-----	----	-----	----	-----	----
B		-----	----	-----	----	-----	----	-----	----	-----	----
C	C-2>C-1	-----	----	6.534	.025	-----	----	-----	----	-----	----
AB		-----	----	-----	----	-----	----	3.617	.10	-----	----
AC		-----	----	-----	----	-----	----	3.583	.10	-----	----
BC		-----	----	-----	----	-----	----	7.037	.025	-----	----
ABC		-----	----	-----	----	-----	----	4.979	.05	-----	----

---

[1] For method of computation, see footnote on Table LXI, p. 199.

[2] For names of factors A, B, and C consult Table V, p. 43.

TABLE LVIII

Summary of Analyses of Variance[1]
Gains on Differential Art Judgments on the Multiple Purpose Drawing Exercise: Divergent Domain
Junior Sample, N=48

Source of Variation[2]	Direction	Alteration of Viewpoint F-Ratio	Alteration of Viewpoint Probability	Rearrangement of Objects F-Ratio	Rearrangement of Objects Probability	Dominance-Subordination F-Ratio	Dominance-Subordination Probability	Divergent Total F-Ratio	Divergent Total Probability
A	-----	------	----	------	----	------	----	------	----
B	B-1>B-2	------	----	------	----	4.735	.05	------	----
C	C-1>C-2	------	----	5.043	.05	------	----	------	----
AB	-----	------	----	------	----	------	----	------	----
AC	-----	------	----	------	----	------	----	------	----
BC	-----	------	----	------	----	------	----	------	----
ABC	-----	------	----	------	----	------	----	------	----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] For names of factors A, B, and C consult Table V, p. 43.

APPENDIX I: Single Analyses of Variance Utilizing the Internal or Comparative Art Dependent Variables

TABLE LIX

Analysis of Variance Table[1]
External or Comparative Judgments: Aesthetic Quality (3 factor analysis)
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	354.95	354.95	------	----	-----
B	1	1725.80	1725.80	4.280	.05	B-1> B-2
C	1	67.12	67.12	------	----	-----
AB	1	0.06	0.06	------	----	-----
AC	1	94.17	94.17	------	----	-----
BC	1	63.77	63.77	------	----	-----
ABC	1	363.52	363.52	------	----	-----
Within Subgroups	88	35517.16	403.60	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LX

Analysis of Variance Table[1]
External or Comparative Judgments: Spontaneity
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	63.57	63.57	------	----	-----
B	1	620.44	620.44	1.117	----	-----
AB	1	486.43	486.43	------	----	-----
C	1	529.74	529.74	------	----	-----
AC	1	0.98	0.98	------	----	-----
BC	1	441.48	441.48	------	----	-----
ABC	1	138.53	138.53	------	----	-----
D	1	5861.12	5861.12	10.550	.005	D-2>D-1
AD	1	110.90	110.90	------	----	-----
BD	1	421.94	421.94	------	----	-----
CD	1	1054.80	1054.80	1.899	----	-----
ABD	1	4244.18	4244.18	7.640	.01	-----
ACD	1	1488.56	1488.56	2.679	----	-----
BCD	1	2.80	2.80	------	----	-----
ABCD	1	2544.98	2544.98	4.585	.05	-----
Within Subgroups	80	44402.36	555.03	------	----	-----

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[1] For method of computation, see footnote on Table LXi, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXI

Analysis of Variance Table[1]
External or Comparative Judgments: Aesthetic Quality
N=96

Source of Variation[2]	Degress of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	240.10	240.10	------	----	-----
B	1	2176.70	2176.70	5.181	.05	B-1>B-2
AB	1	5.67	5.67	------	----	-----
C	1	66.06	66.06	------	----	-----
AC	1	103.89	103.89	------	----	-----
BC	1	15.77	15.77	------	----	-----
ABC	1	434.86	434.86	1.035	----	-----
D	1	81.03	81.03	------	----	-----
AD	1	0.32	0.32	------	----	-----
BD	1	256.04	265.04	------	----	-----
CD	1	719.14	719.14	1.712	----	-----
ABD	1	177.43	177.43	------	----	-----
ACD	1	56.91	56.91	------	----	-----
BCD	1	270.31	270.31	------	----	-----
ABCD	1	297.29	297.29	------	----	-----
Within Subgroups	80	33618.09	420.23	------	----	-----

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[1] For unequal N's, by the method of expected subclass numbers. See Snedecor, George W. and Cox, Gertrude M., "Disproportionate subclass numbers in tables of multiple classification," Iowa Agricultural Experimental Station Research Bulletin 180:233-72, 1935.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXII

Analysis of Variance Table[1]
External or Comparative Judgments: Divergency
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	183.59	183.59	------	----	-----
B	1	625.00	625.00	------	----	-----
AB	1	1187.89	1187.89	1.912	----	-----
C	1	906.28	906.28	1.459	----	-----
AC	1	194.33	194.33	------	----	-----
BC	1	93.85	93.85	------	----	-----
ABC	1	1308.83	1308.83	2.107	----	-----
D	1	4644.08	4644.08	7.477	.01	D-1> D-2
AD	1	620.93	620.93	------	----	-----
BD	1	286.28	286.28	------	----	-----
CD	1	0.01	0.01	------	----	-----
ABD	1	3086.97	3086.97	4.970	.05	-----
ACD	1	2091.78	2091.78	3.368	.10	-----
BCD	1	29.06	29.06	------	----	-----
ABCD	1	1038.06	1038.06	1.668	----	-----
Within Subgroups	80	49777.84	622.22	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXIII

Analysis of Variance Table[1]
External or Comparative Judgments: Greatest Strategy Gain
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	131.92	131.92	------	----	-----
B	1	26.20	26.20	------	----	-----
AB	1	152.71	152.71	------	----	-----
C	1	23.64	23.64	------	----	-----
AC	1	43.03	43.02	------	----	-----
BC	1	115.10	115.10	------	----	-----
ABC	1	97.08	97.08	------	----	-----
D	1	826.17	826.17	2.355	----	-----
AD	1	386.49	386.49	1.102	----	-----
BD	1	698.41	698.41	1.990	----	-----
CD	1	3.89	3.89	------	----	-----
ABD	1	80.69	80.69	------	----	-----
ACD	1	9.98	9.98	------	----	-----
BCD	1	24.34	24.34	------	----	-----
ABCD	1	112.51	112.51	------	----	-----
Within Subgroups	80	28103.49	351.29	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

APPENDIX J: Single Analyses of Variance Utilizing the Internal or Itra-Individual Art Dependent Variables

TABLE LXIV

Analysis of Variance Table[1]
Internal or Intra Judgments: Spontaneity
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	0.38	0.38	------	----	-----
B	1	30.64	30.64	1.342	----	-----
AB	1	0.38	0.38	------	----	-----
C	1	10.60	10.60	------	----	-----
AC	1	0.65	0.65	------	----	-----
BC	1	2.42	2.42	------	----	-----
ABC	1	48.23	48.23	2.113	----	-----
D	1	490.31	490.31	21.475	.005	D-1> D-2
AD	1	11.75	11.75	------	----	-----
BD	1	0.01	0.01	------	----	-----
CD	1	61.77	61.77	2.706	----	-----
ABD	1	35.45	35.45	1.553	----	-----
ACD	1	0.00	0.00	------	----	-----
BCD	1	2.57	2.57	------	----	-----
ABCD	1	202.43	202.43	8.870	.005	-----
Within Subgroups	80	1826.57	22.83	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXV

Analysis of Variance Table[1]
Internal or Intra Judgments: Within Strategy
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	110.99	110.99	6.093	.025	A-1>A-2
B	1	90.02	90.02	4.942	.05	B-1>B-2
AB	1	22.15	22.15	1.216	----	-----
C	1	6.09	6.09	------	----	-----
AC	1	0.61	0.61	------	----	-----
BC	1	15.30	15.30	------	----	-----
ABC	1	14.04	14.04	------	----	-----
D	1	65.82	65.82	3.613	.10	D-1>D-2
AD	1	19.11	19.11	1.049	----	-----
BD	1	0.56	0.56	------	----	-----
CD	1	9.97	9.97	------	----	-----
ABD	1	10.98	10.98	------	----	-----
ACD	1	14.64	14.64	------	----	-----
BCD	1	2.53	2.53	------	----	-----
ABCD	1	1.80	1.80	------	----	-----
Within Subgroups	80	1457.45	18.22	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXVI

Analysis of Variance Table[1]
Internal or Intra Judgments: Combined Strategies
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	84.30	84.30	2.681	----	-----
B	1	181.27	181.27	5.764	.025	B-1>B-2
AB	1	32.60	32.60	1.037	----	-----
C	1	36.82	36.82	1.171	----	-----
AC	1	6.33	6.33	------	----	-----
BC	1	10.88	10.88	------	----	-----
ABC	1	1.62	1.62	------	----	-----
D	1	94.67	94.67	3.010	.10	D-1>D-2
AD	1	17.04	17.04	------	----	-----
BD	1	0.78	0.78	------	----	-----
CD	1	2.42	2.42	------	----	-----
ABD	1	16.38	16.38	------	----	-----
ACD	1	42.15	42.15	1.340	----	-----
BCD	1	0.46	0.46	------	----	-----
ABCD	1	0.42	0.42	------	----	-----
Within Subgroups	80	2518.77	31.48	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXVII

Analysis of Variance Table[1]
Internal or Intra Judgments: Divergency
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	73.31	73.31	2.346	----	-----
B	1	62.85	62.85	2.011	----	-----
AB	1	25.98	25.98	------	----	-----
C	1	7.91	7.91	------	----	-----
AC	1	2.92	2.92	------	----	-----
BC	1	23.57	23.57	------	----	-----
ABC	1	32.21	32.21	1.031	----	-----
D	1	154.10	154.10	4.931	.05	D-2>D-1
AD	1	0.49	0.49	------	----	-----
BD	1	0.60	0.60	------	----	-----
CD	1	39.68	39.68	1.270	----	-----
ABD	1	99.98	99.98	3.199	.10	-----
ACD	1	42.14	42.14	1.348	----	-----
BCD	1	0.87	0.87	------	----	-----
ABCD	1	184.35	184.35	5.90	.025	-----
Within Subgroups	80	2500.77	31.26	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXVIII

Analysis of Variance Table[1]
Internal or Intra Judgments: Opposite Strategy
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	1.83	1.83	------	----	-----
B	1	15.81	15.81	2.640	----	-----
AB	1	1.01	1.01	------	----	-----
C	1	12.98	12.98	2.167	----	-----
AC	1	10.91	10.91	1.823	----	-----
BC	1	0.38	0.38	------	----	-----
ABC	1	6.13	6.13	1.024	----	-----
D	1	2.61	2.61	------	----	-----
AD	1	0.06	0.06	------	----	-----
BD	1	0.02	0.02	------	----	-----
CD	1	2.56	2.56	------	----	-----
ABD	1	0.54	0.54	------	----	-----
ACD	1	7.11	7.11	1.188	----	-----
BCD	1	5.08	5.08	------	----	-----
ABCD	1	3.98	3.98	------	----	-----
Within Subgroups	80	478.51	5.98	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

APPENDIX K: Single Analyses of Variance Utilizing the Dependent Variables Representing the Capacity for Creative Action

TABLE LXIX

Analysis of Variance Table[1]
Capacity for Creative Action: Aestheticism
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	0.16	0.16	------	----	-----
B	1	11.80	11.80	2.513	----	-----
AB	1	0.11	0.11	------	----	-----
C	1	31.62	31.62	6.735	.025	C-1>C-2
AC	1	0.54	0.54	------	----	-----
BC	1	1.95	1.95	------	----	-----
ABC	1	2.03	2.03	------	----	-----
D	1	1.05	1.05	------	----	-----
AD	1	5.35	5.35	1.140	----	-----
BD	1	0.14	0.14	------	----	-----
CD	1	0.19	0.19	------	----	-----
ABD	1	17.75	17.75	3.781	.10	-----
ACD	1	1.83	1.83	------	----	-----
BCD	1	2.32	2.32	------	----	-----
ABCD	1	0.74	0.74	------	----	-----
Within Subgroups	80	375.92	4.70	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXX

Analysis of Variance Table[1]
Capacity for Creative Action: Complexity
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	6.25	6.25	2.137	----	-----
B	1	1.17	1.17	------	----	-----
AB	1	0.17	0.17	------	----	-----
C	1	0.35	0.35	------	----	-----
AC	1	0.05	0.05	------	----	-----
BC	1	1.69	1.69	------	----	-----
ABC	1	0.57	0.57	------	----	-----
D	1	1.97	1.97	------	----	-----
AD	1	6.01	6.01	2.055	----	-----
BD	1	1.04	1.04	------	----	-----
CD	1	3.28	3.28	1.122	----	-----
ABD	1	4.33	4.33	1.479	----	-----
ACD	1	18.75	18.75	6.412	.025	-----
BCD	1	0.07	0.07	------	----	-----
ABCD	1	3.26	3.26	1.120	----	-----
Within Subgroups	80	234.03	2.93	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXI

Analysis of Variance Table[1]
Capacity for Creative Action: Social Self-Determination
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	9.87	9.87	2.309	----	-----
B	1	11.92	11.92	2.789	.10	B-1>B-2
AB	1	2.48	2.48	------	----	-----
C	1	18.02	18.02	4.218	.05	C-1>C-2
AC	1	13.19	13.19	3.087	.10	-----
BC	1	0.45	0.45	------	----	-----
ABC	1	1.22	1.22	------	----	-----
D	1	0.25	0.25	------	----	-----
AD	1	1.11	1.11	------	----	-----
BD	1	3.12	3.12	------	----	-----
CD	1	0.18	0.18	------	----	-----
ABD	1	0.00	0.00	------	----	-----
ACD	1	13.31	13.31	3.115	.10	-----
BCD	1	0.27	0.27	------	----	-----
ABCD	1	1.14	1.14	------	----	-----
Within Subgroups	80	342.11	4.28	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXII

Analysis of Variance Table[1]
Capacity for Creative Action: Theory
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	0.26	0.26	------	----	-----
B	1	0.18	0.18	------	----	-----
AB	1	0.27	0.27	------	----	-----
C	1	2.65	2.65	------	----	-----
AC	1	23.48	23.48	7.491	.01	-----
BC	1	0.00	0.00	------	----	-----
ABC	1	0.46	0.46	------	----	-----
D	1	3.49	3.49	1.112	----	-----
AD	1	0.13	0.13	------	----	-----
BD	1	0.69	0.69	------	----	-----
CD	1	1.05	1.05	------	----	-----
ABD	1	0.02	0.02	------	----	-----
ACD	1	7.03	7.03	------	----	-----
BCD	1	0.37	0.37	------	----	-----
ABCD	1	3.93	3.93	------	----	-----
Within Subgroups	80	250.42	3.13	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXIII

Analysis of Variance Table[1]
Capacity for Creative Action: Creative Independence
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	56.43	56.43	3.194	.10	A-1>A-2
B	1	6.12	6.12	------	----	-----
AB	1	0.00	0.00	------	----	-----
C	1	8.97	8.97	------	----	-----
AC	1	4.01	4.01	------	----	-----
BC	1	8.85	8.85	------	----	-----
ABC	1	2.14	2.14	------	----	-----
D	1	84.08	84.08	4.759	.05	D-1>D-2
AD	1	49.41	49.41	------	----	-----
BD	1	1.66	1.66	------	----	-----
CD	1	30.79	30.79	1.743	----	-----
ABD	1	40.05	40.05	2.267	----	-----
ACD	1	91.10	91.10	5.156	.05	-----
BCD	1	7.87	7.87	------	----	-----
ABCD	1	13.98	13.98	------	----	-----
Within Subgroups	80	1413.30	17.67	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXIV

Analysis of Variance Table[1]
Capacity for Creative Action: Originality
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	8.05	8.05	3.359	.10	A-1>A-2
B	1	0.40	0.40	------	----	-----
AB	1	0.26	0.26	------	----	-----
C	1	0.18	0.18	------	----	-----
AC	1	2.24	2.24	------	----	-----
BC	1	16.73	16.73	6.978	.01	-----
ABC	1	0.03	0.03	------	----	-----
D	1	2.95	2.95	------	----	-----
AD	1	0.34	0.34	------	----	-----
BD	1	7.83	7.83	3.266	.10	-----
CD	1	4.45	4.45	1.855	----	-----
ABD	1	16.96	16.96	7.072	.01	-----
ACD	1	19.74	19.74	8.232	.01	-----
BCD	1	0.68	0.68	------	----	-----
ABCD	1	0.07	0.07	------	----	-----
Within Subgroups	80	192.07	2.40	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXV

Analysis of Variance Table[1]
Capacity for Creative Action: Object Question
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	0.44	0.44	------	----	-----
B	1	0.03	0.03	------	----	-----
AB	1	0.40	0.40	------	----	-----
C	1	5.22	5.22	------	----	-----
AC	1	39.95	39.95	7.111	.01	-----
BC	1	9.77	9.77	1.740	----	-----
ABC	1	0.60	0.60	------	----	-----
D	1	4.92	4.92	------	----	-----
AD	1	11.63	11.63	2.069	----	-----
BD	1	3.93	3.93	------	----	-----
CD	1	7.27	7.27	1.294	----	-----
ABD	1	2.75	2.75	------	----	-----
ACD	1	21.28	21.28	3.788	.10	-----
BCD	1	0.47	0.47	------	----	-----
ABCD	1	7.97	7.97	1.420	----	-----
Within Subgroups	80	448.37	5.60	------	----	-----

---

[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

TABLE LXXVI

Analysis of Variance Table[1]
Capacity for Creative Action: Flexibility
N=96

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	35.74	35.74	1.994	----	-----
B	1	77.70	77.70	4.335	.05	B-2>B-1
AB	1	0.09	0.09	------	----	-----
C	1	19.80	19.80	1.105	----	-----
AC	1	12.33	12.33	------	----	-----
BC	1	2.72	2.72	------	----	-----
ABC	1	0.46	0.46	------	----	-----
D	1	1.77	1.77	------	----	-----
AD	1	48.67	48.67	2.716	----	-----
BD	1	10.30	10.30	------	----	-----
CD	1	2.18	2.18	------	----	-----
ABD	1	17.57	17.57	------	----	-----
ACD	1	2.31	2.31	------	----	-----
BCD	1	21.57	21.57	1.204	----	-----
ABCD	1	6.66	6.66	------	----	-----
Within Subgroups	80	1433.64	17.92	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table V for factor names and subclass N's, p. 43.

APPENDIX L: Figures and Tables Illustrating Period to Period Changes or Dynamics on the External Art Dependent Variables for the Major Experiment

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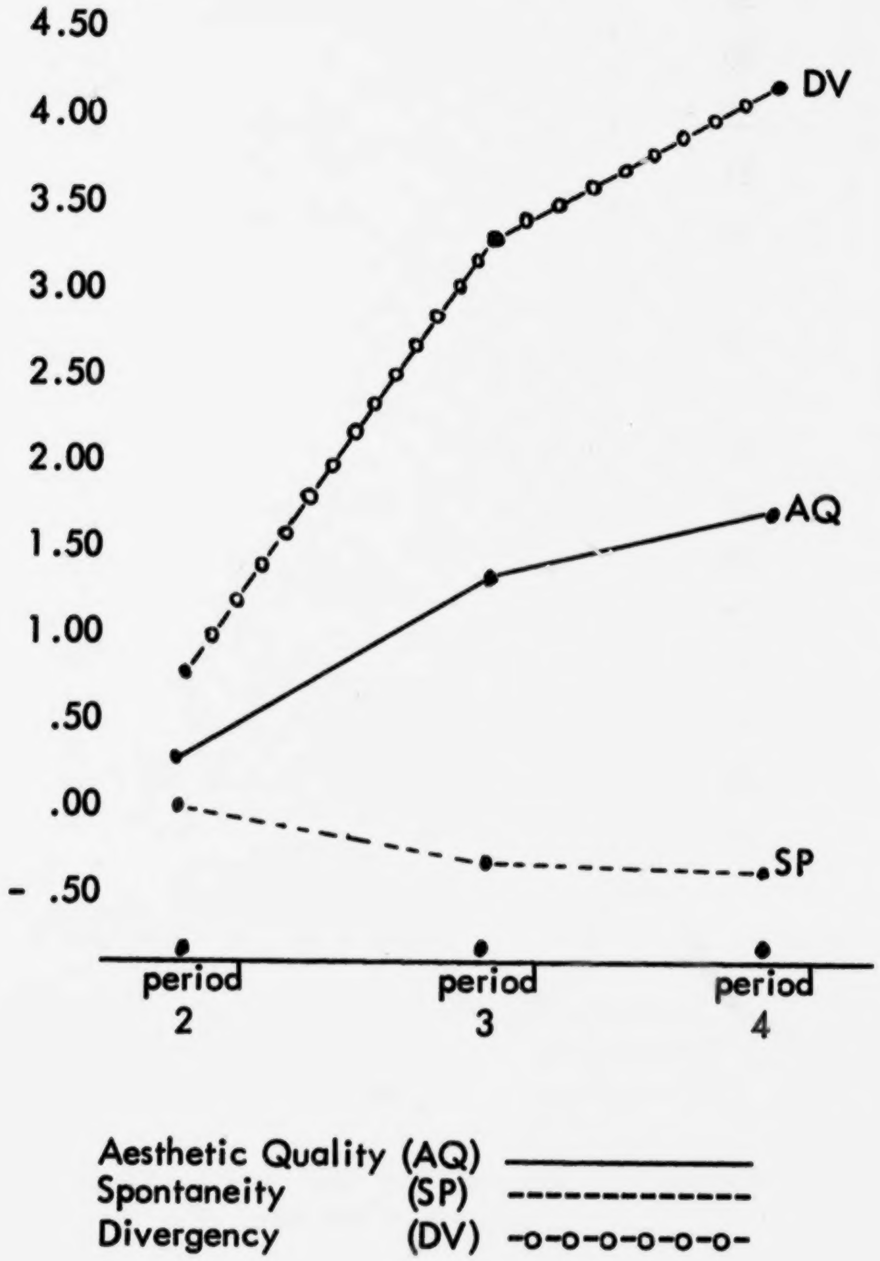


Figure 11. Mean Gains of Total Group by Experimental Periods: External Art Judgments

N=96

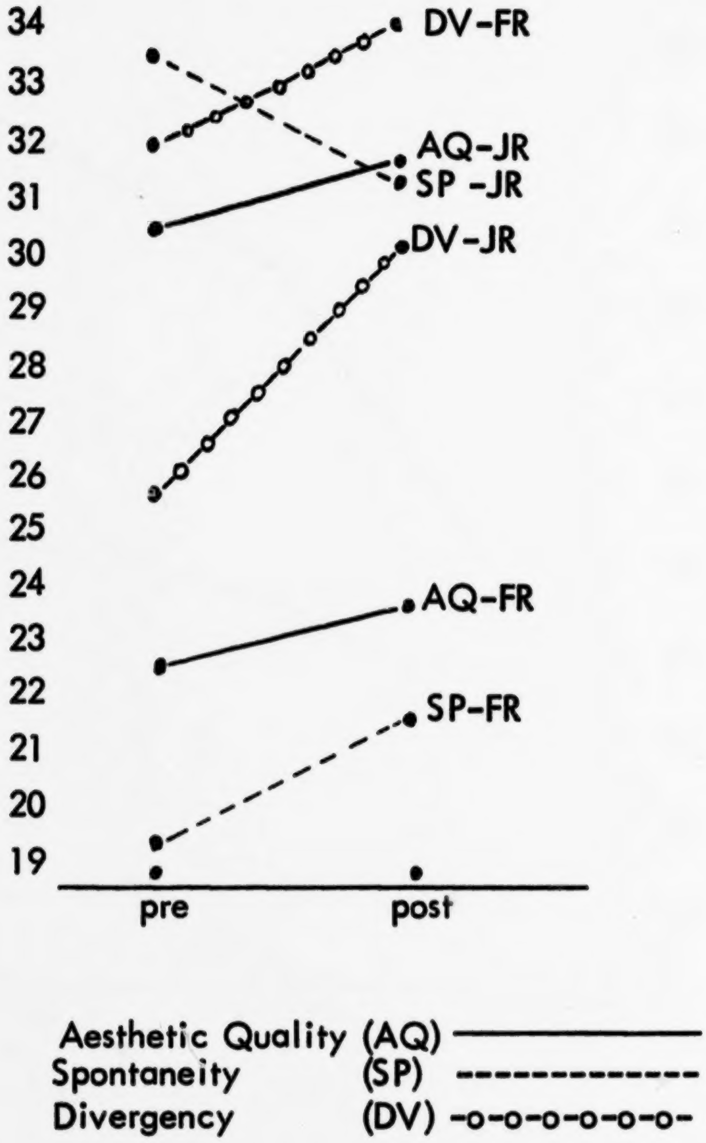


Figure 12. Pre and Post Positions of Juniors (N=48) and Freshmen (N=48): External Art Judgments

TABLE LXXVII

Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality
N=96

	Period 2	Period 3	Period 4
Factor A-1 (N=46)	- .25	2.20	2.94
A-2 (N=50)	.60	.71	.83
B-1 (N=50)	1.35	3.65	3.51
B-2 (N=46)	-1.07	-1.00	.03
C-1 (N=44)	- .87	2.70	2.20
C-2 (N=52)	1.09	.34	1.54
D-1 (N=43)	.46	1.66	1.92
D-2 (N=53)	- .02	1.24	1.78
A-1, B-1, C-1 (average)	.08	2.82	2.85
A-2, B-2, C-2 (average)	.20	.02	.79

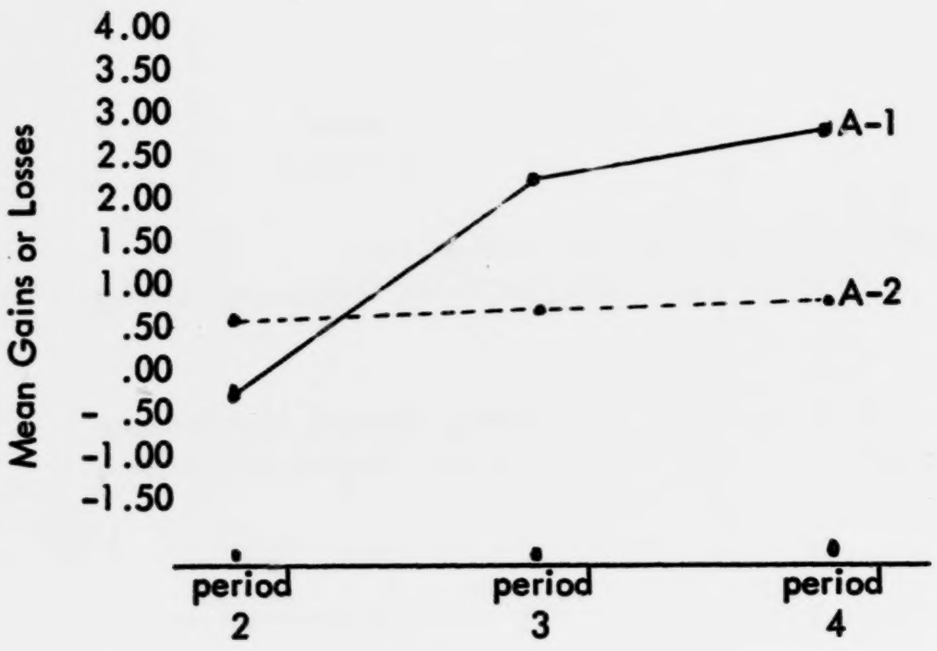
Mean Gains of Treatment Groups by Experimental Periods: Spontaneity
N=96

	Period 2	Period 3	Period 4
Factor A-1 (N=46)	.63	.20	- .86
A-2 (N=50)	-1.12	- .74	.87
B-1 (N-50)	.54	.98	.81
B-2 (N=46)	-1.17	-1.68	- .80
C-1 (N=44)	- .18	1.34	.54
C-2 (N=52)	- .36	-1.68	- .38
D-1 (N=43)	-4.18	-2.72	-3.02
D-2 (N=53)	2.89	1.68	2.52
A-1, B-1, C-1 (average)	.33	.84	.16
A-2, B-2, C-2 (average)	- .88	-1.37	- .10

TABLE LXXVIII

Mean Gains of Treatment Groups by Experimental Periods: Divergency
N=96

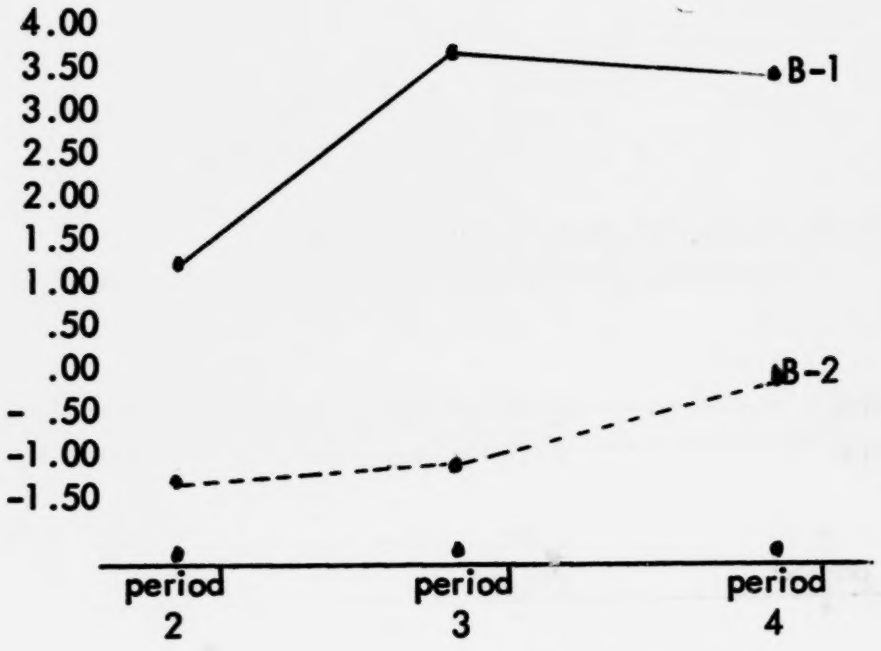
	Period 2	Period 3	Period 4
Factor A-1 (N=46)	1.35	2.93	6.56
A-2 (N=50)	1.80	3.62	2.61
B-1 (N=50)	.95	2.59	3.33
B-2 (N=46)	2.28	4.10	5.77
C-1 (N=44)	1.50	1.91	2.55
C-2 (N=52)	1.66	4.50	6.16
D-1 (N=43)	4.63	5.29	7.47
D-2 (N=53)	- .88	1.71	2.09
A-1, B-1, C-1 (average)	1.27	2.49	4.14
A-2, B-2, C-2 (average)	1.91	4.07	4.84



Self-Discovered Criteria, Factor A-1= ———— (N=46)
External Criteria, Factor A-2= --------- (N=50)

Figure 13. Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality

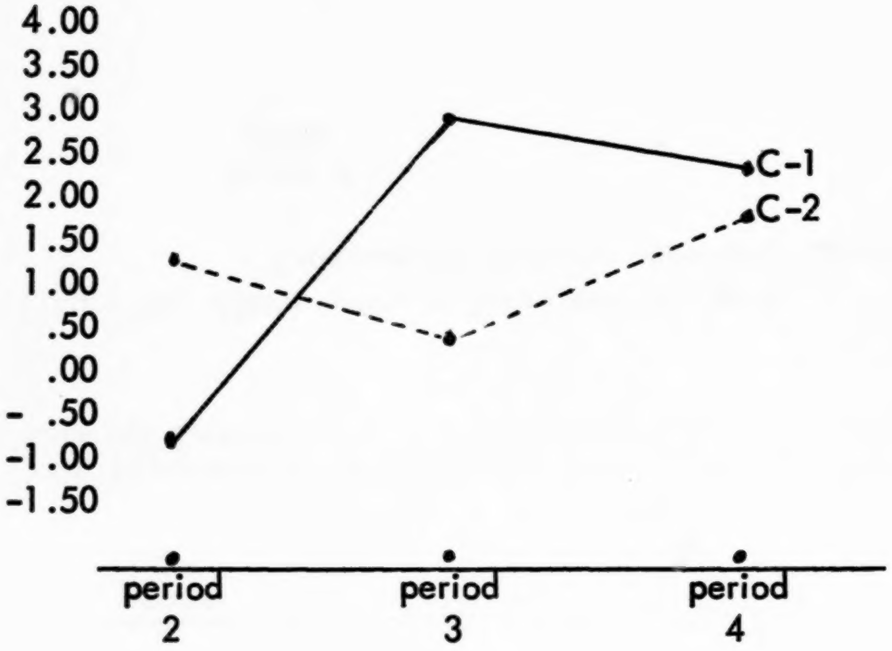
Factor A
N=96



Process Feedback, Factor B-1 = ———— (N=50)
Product Feedback, Factor B-2 = ------------ (N=46)

Figure 14. Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality

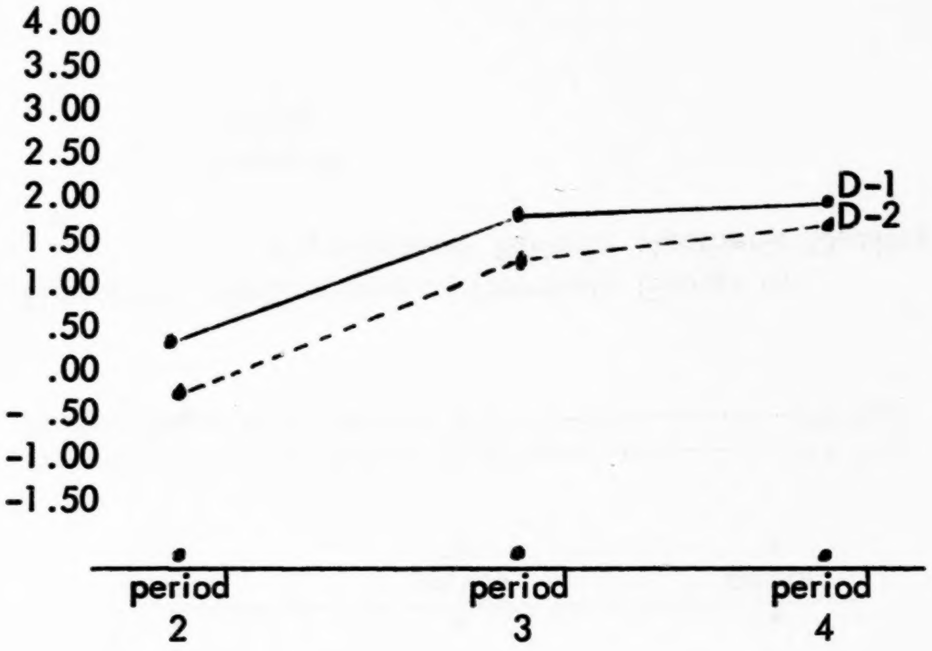
Factor B
N=96



Interactive Setting, Factor C-1, ———————— (N=44)
Independent Setting, Factor C-2, ---------- (N=52)

Figure 15. Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality

Factor C
N=96



Spontaneous Students, Factor D-1 ———————— (N=43)
Divergent Students, Factor D-2 ------------ (N=53)

Figure 16. Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality

Factor D
N=96

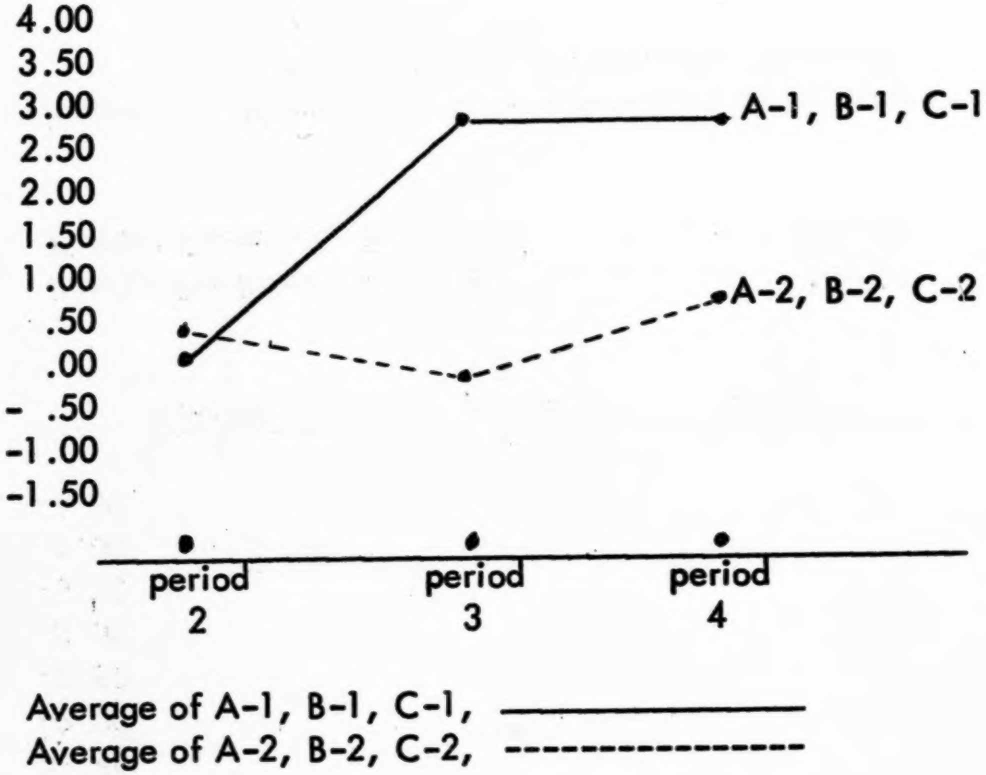


Figure 17. Mean Gains of Treatment Groups by Experimental Periods: Aesthetic Quality

Factors A, B, C
N=96

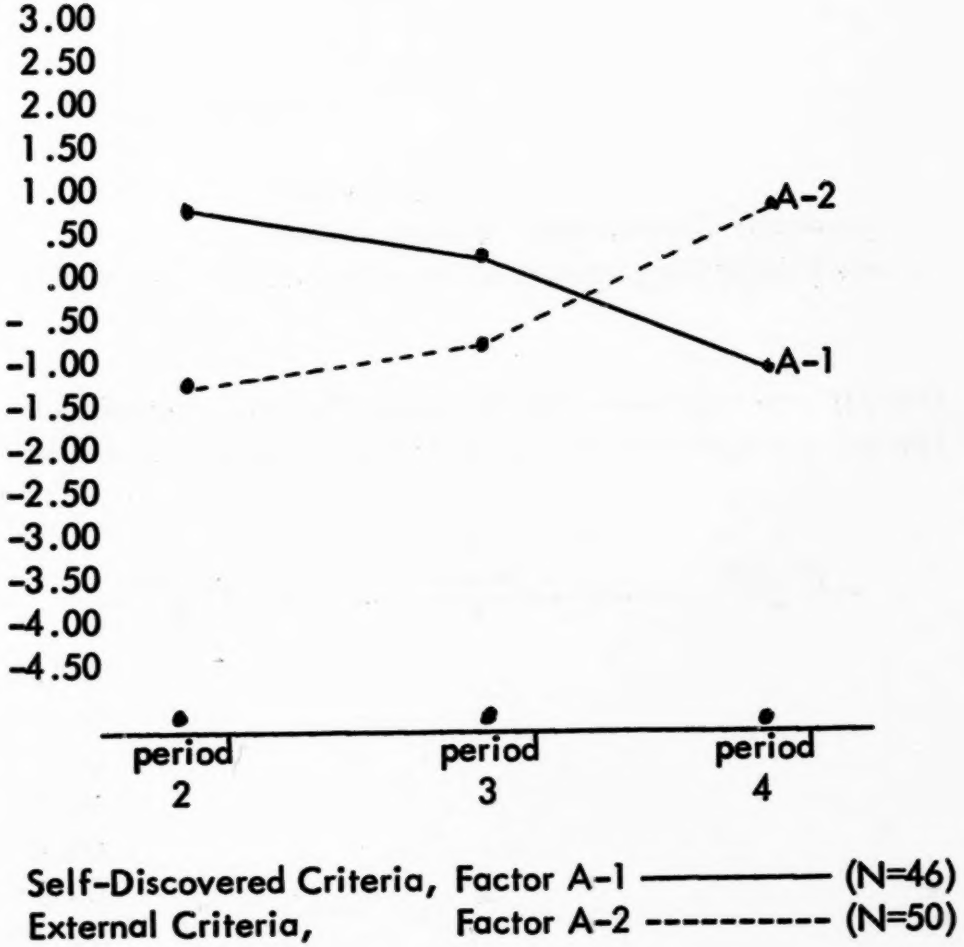
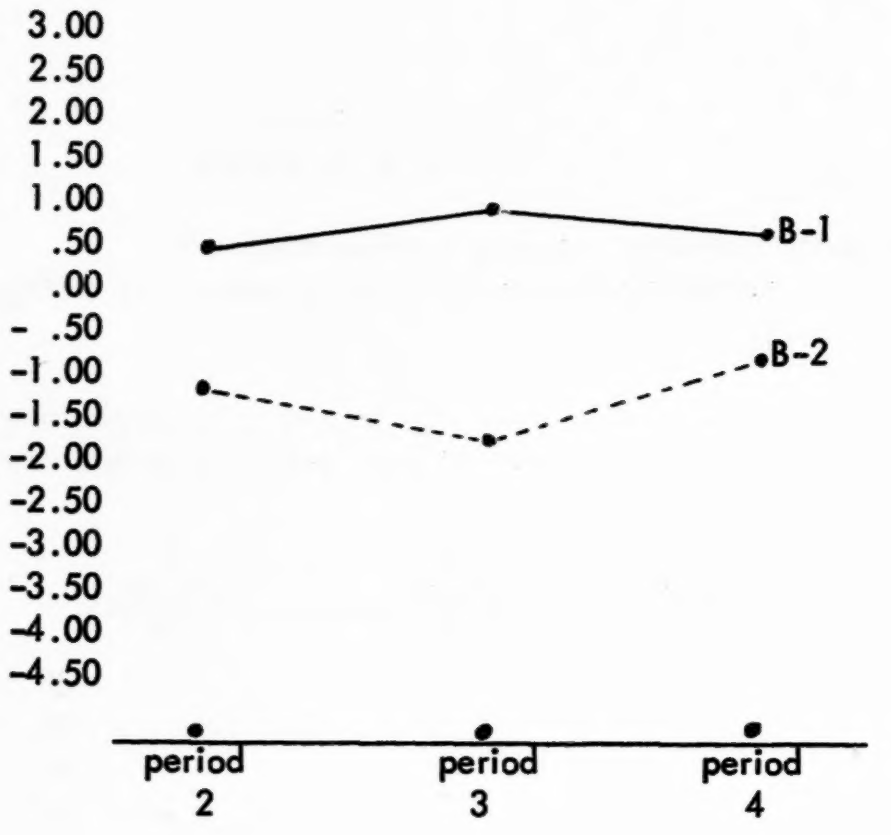


Figure 18. Mean Gains of Treatment Groups by Experimental Periods: Spontaneity (External Judgment)

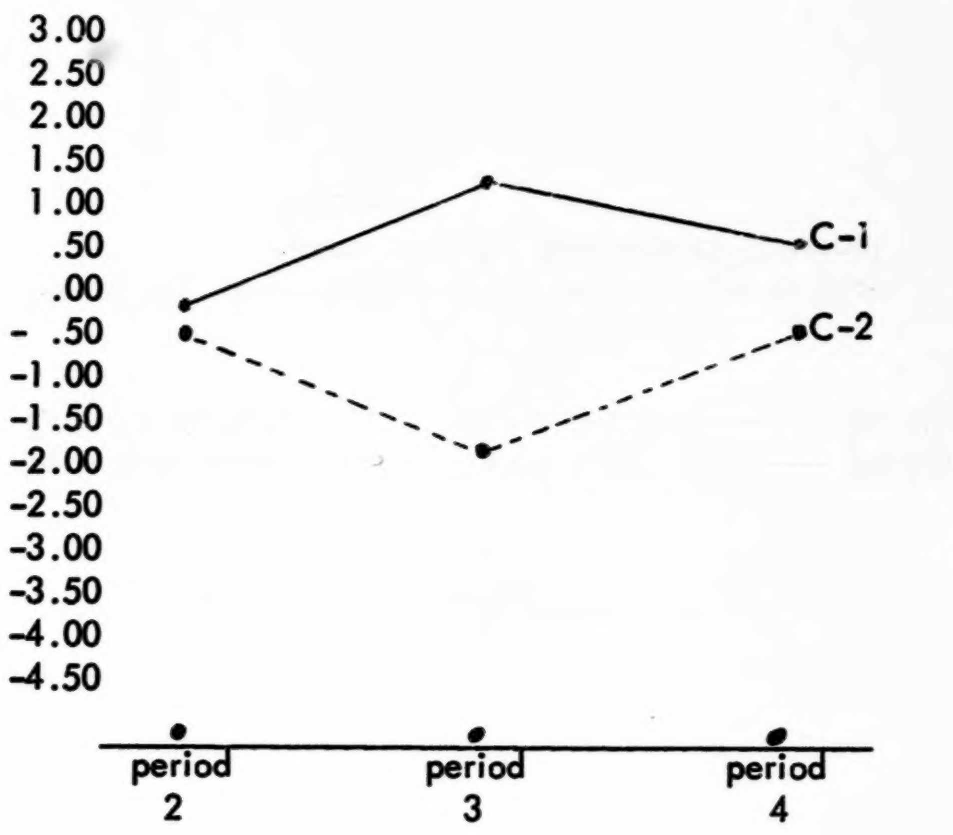
Factor A



Process Feedback, Factor B-1 ———————— (N=50)
Product Feedback, Factor B-2 ------------ (N=46)

Figure 19. Mean Gains of Treatment Groups by Experimental Periods: Spontaneity (External Judgment)

Factor B



Interactive Setting, Factor C-1, ———————— (N=44)
Independent Setting, Factor C-2, ------------ (N=52)

Figure 20. Mean Gains of Treatment Groups by Experimental Periods: Spontaneity (External Judgment)

Factor C

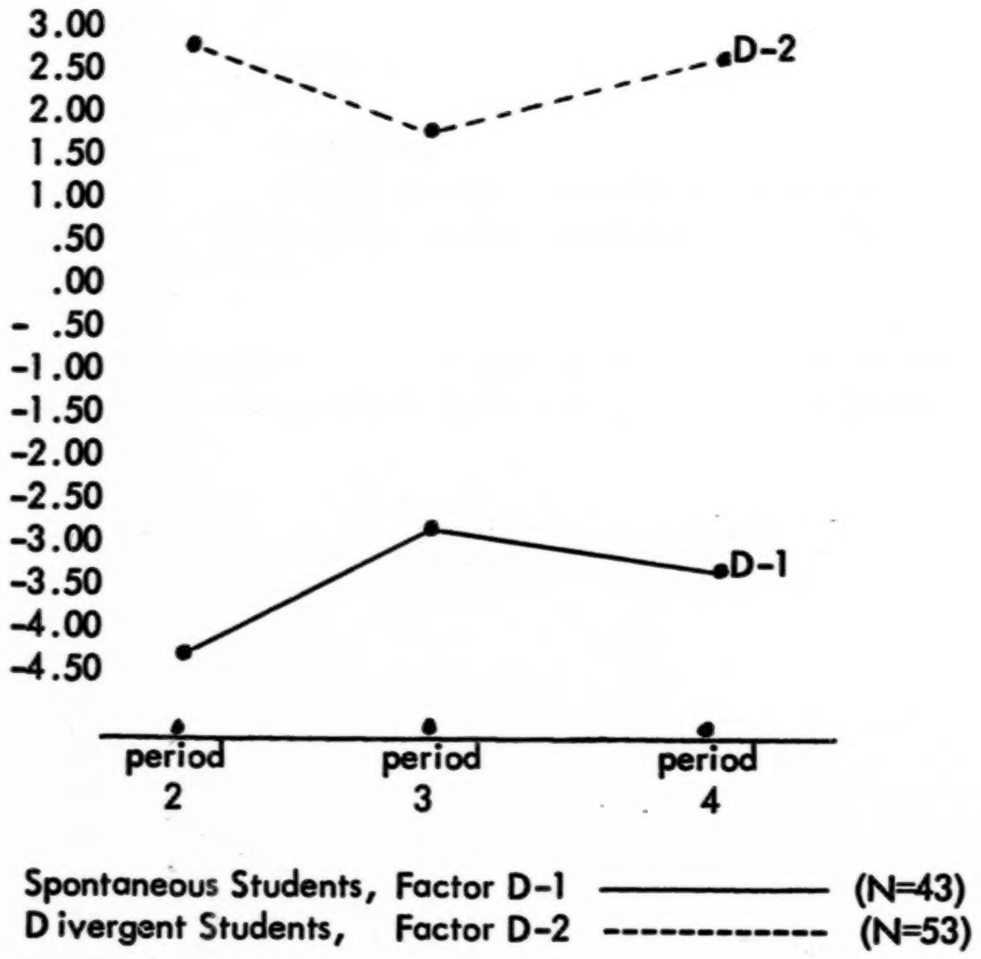


Figure 21. Mean Gains of Treatment Groups by Experimental Periods: Spontaneity (External Judgment)

Factor D

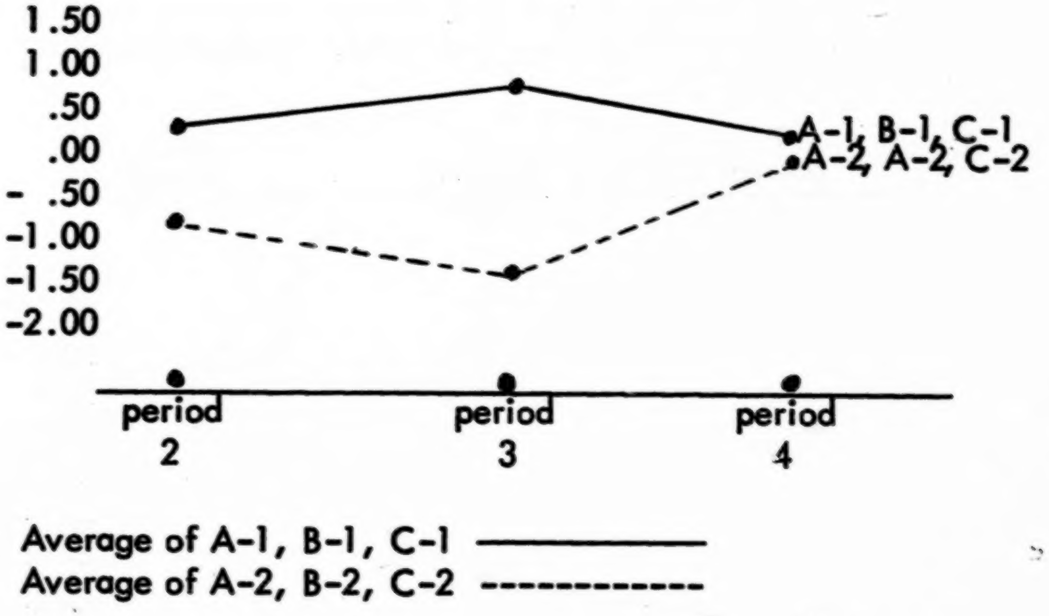


Figure 22. Mean Gains of Treatment Groups by Experimental Periods: Spontaneity (External Judgment)

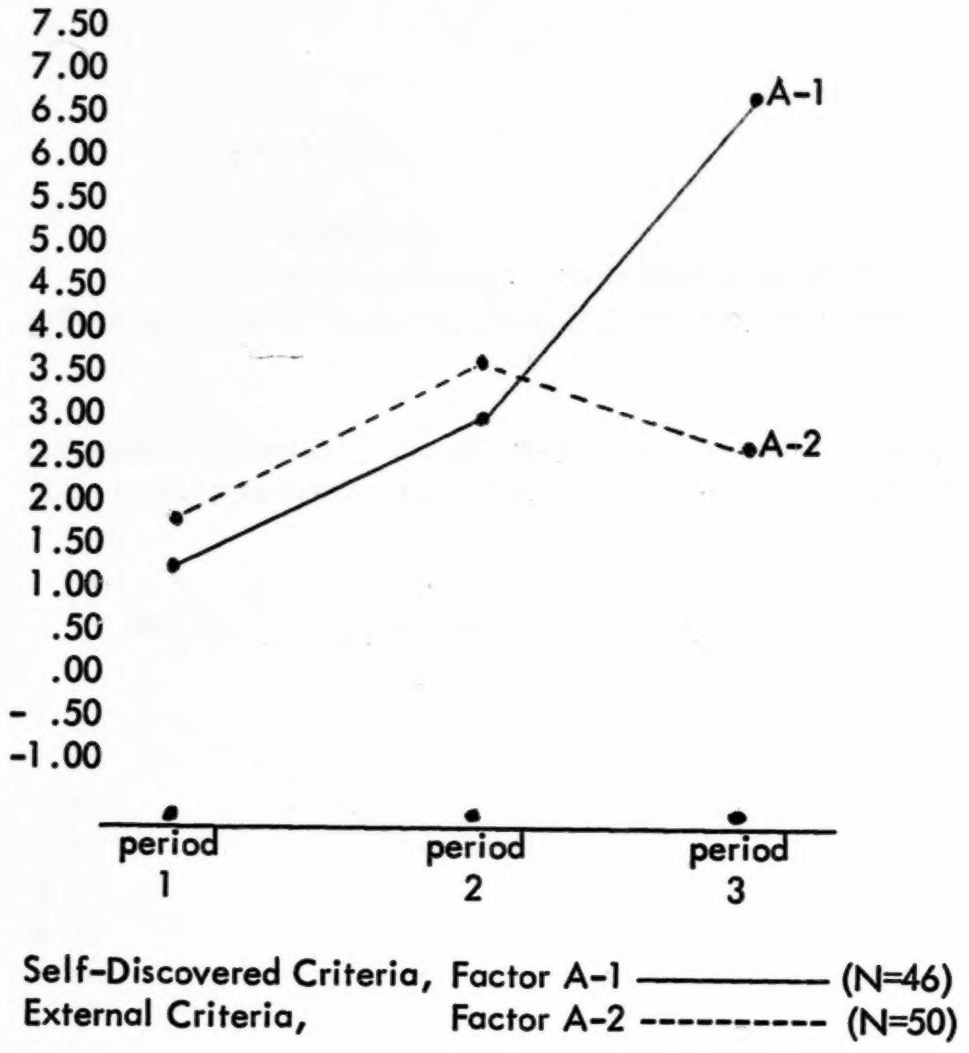


Figure 23. Mean Gains of Treatment Groups by Experimental Periods: Divergency (External Judgment)

Factor A

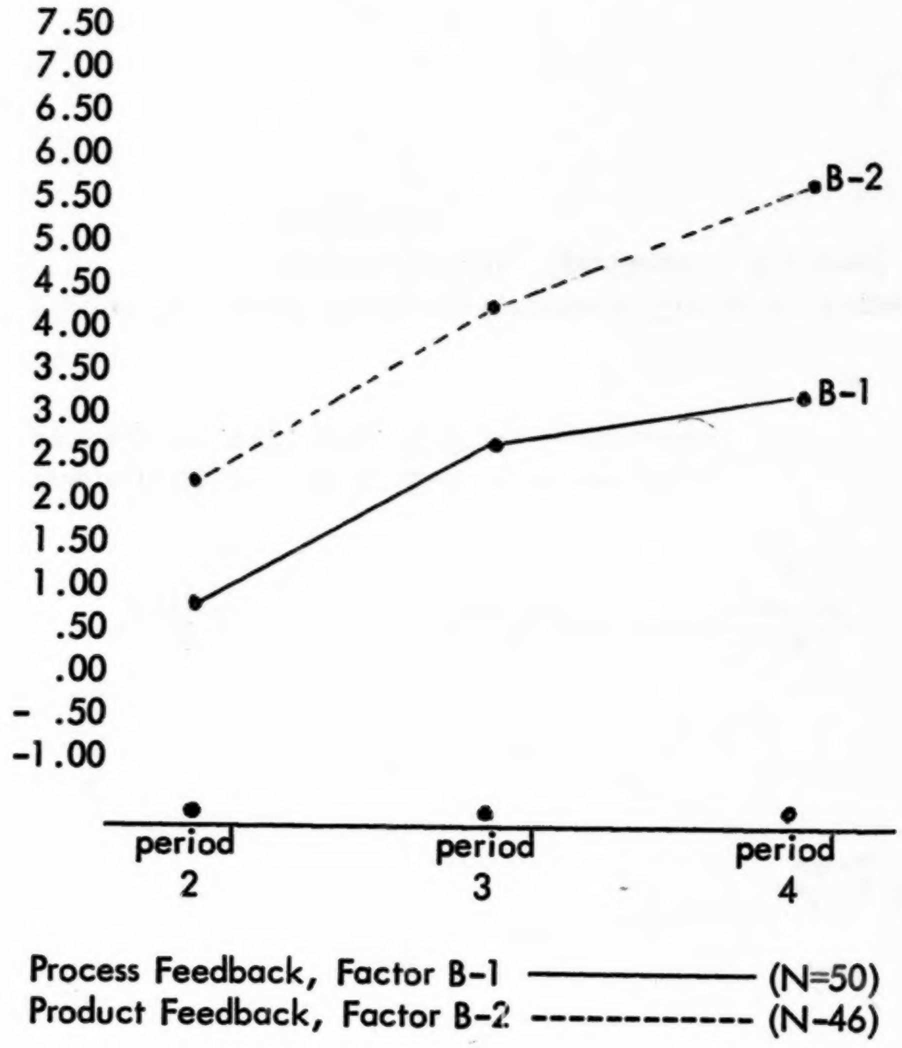


Figure 24. Mean Gains of Treatment Groups by Experimental Periods: Divergency (External Judgment)

Factor B

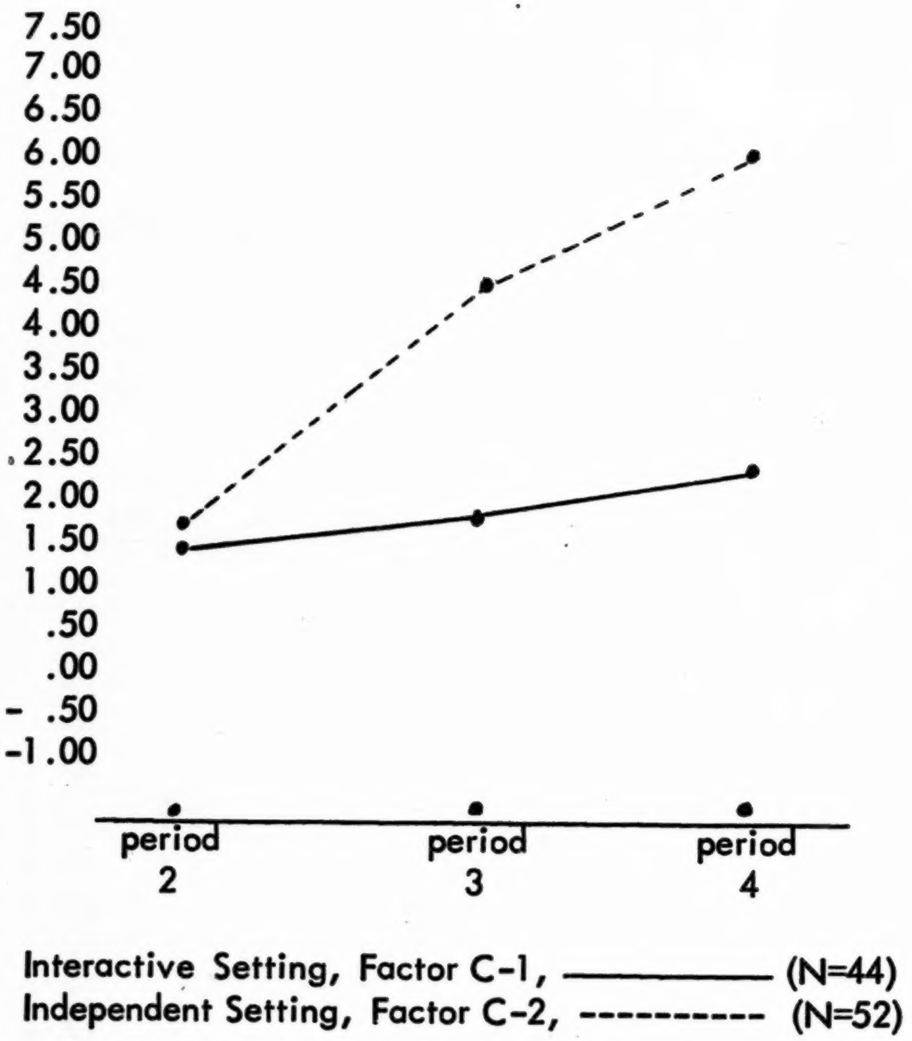


Figure 25. Mean Gains of Treatment Groups by Experimental Periods: Divergency (External Judgment)

Factor C

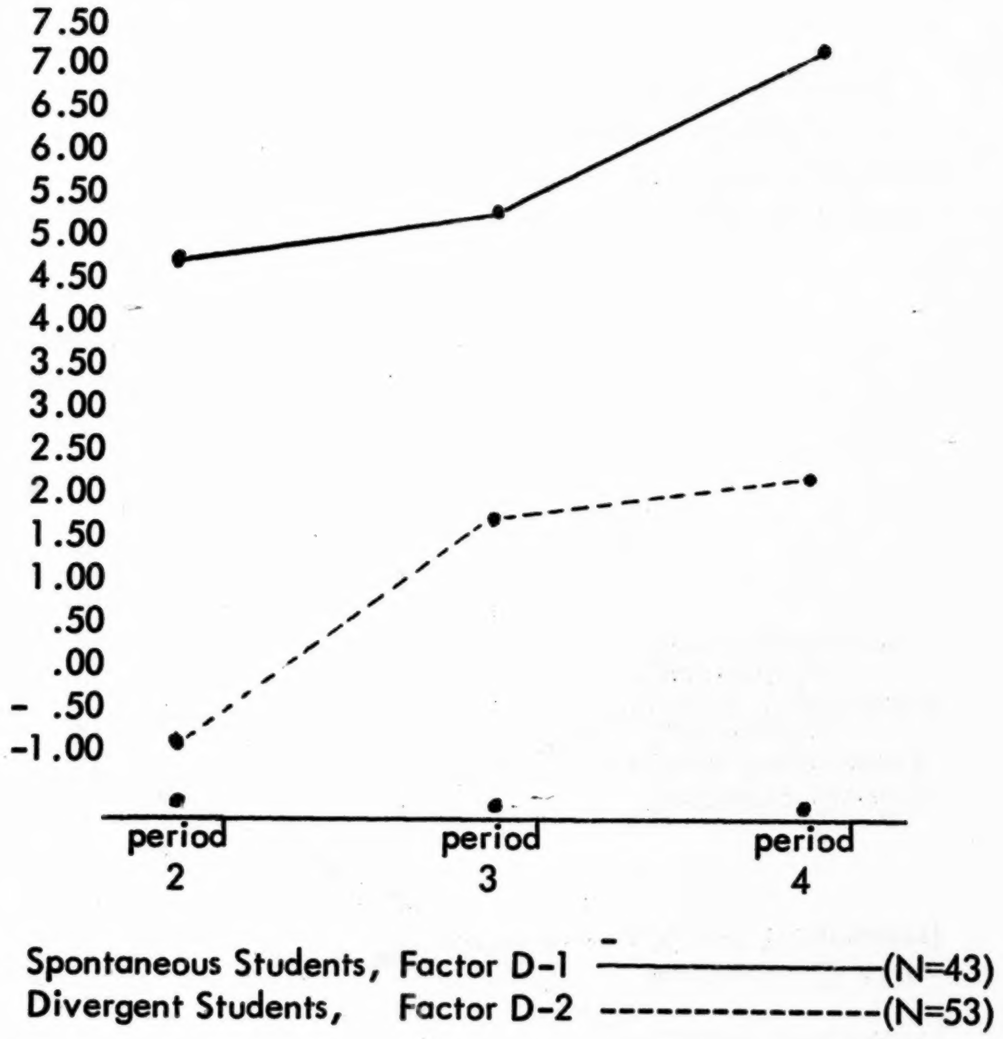


Figure 26. Mean Gains of Treatment Groups by Experimental Periods: Divergency (External Judgment)

Factor D

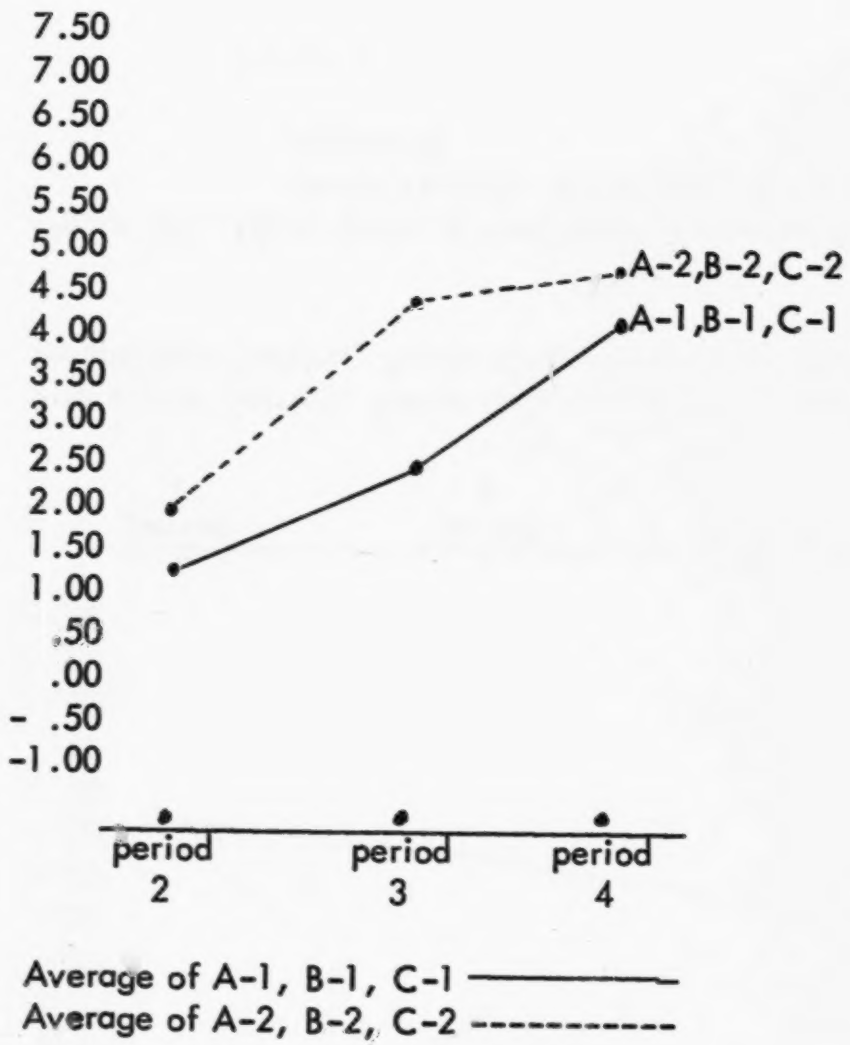


Figure 27. Mean Gains of Treatment Groups by Experimental Periods: Divergency (External Judgment)

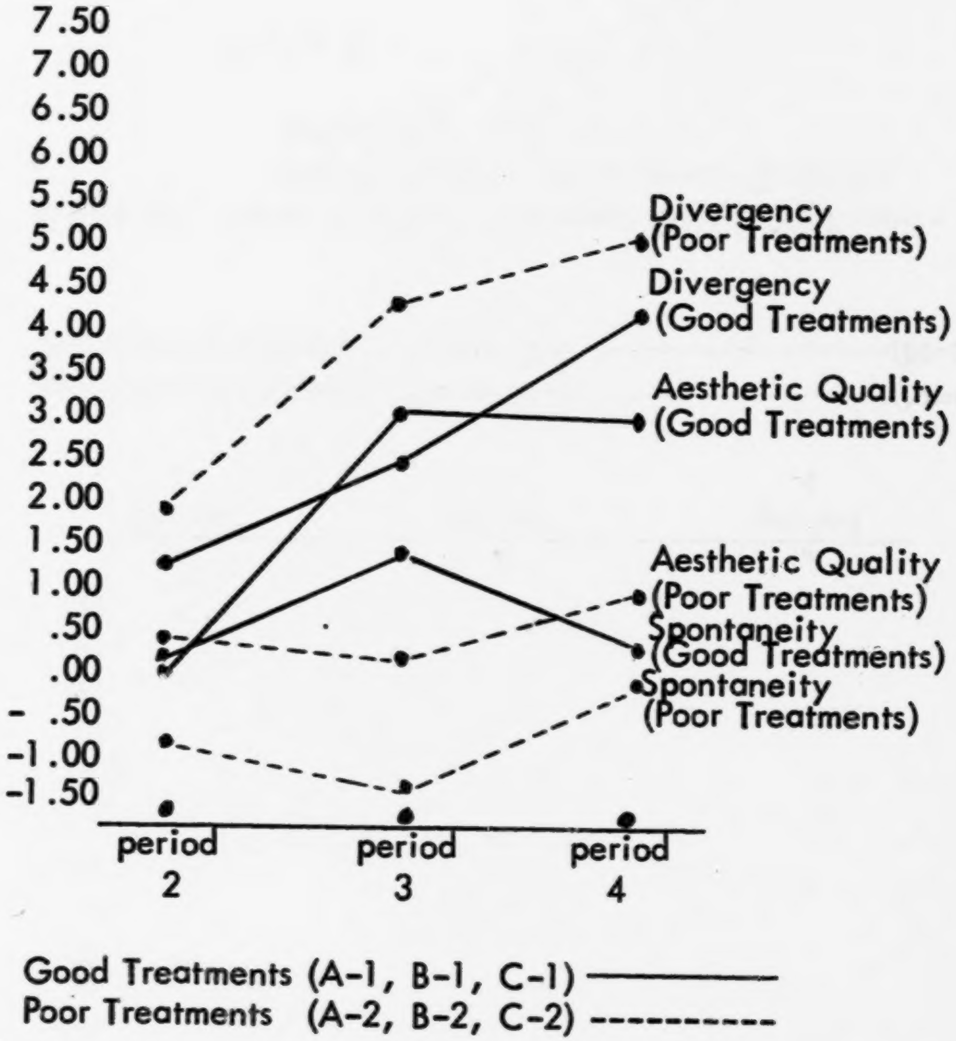


Figure 28. Mean Gains of Treatment Groups by Experimental Periods: Good and Poor Treatments Averaged Across Aesthetic Quality, Spontaneity, and Divergency (External Judgments)

APPENDIX M: Single Analyses of Variance and Period to Period Means on External Art Dependent Variables for the Teaching Experiment

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TABLE LXXIX

Analysis of Variance Table[1]
Teaching Experiment: External or Comparative Judgments: Aesthetic Quality
N=31

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	674.78	674.78	3.266	----	------
B	2	1254.35	627.18	3.036	----	------
C	1	32.54	32.54	------	----	------
AB	2	748.28	374.14	1.811	----	------
AC	1	220.62	220.62	1.068	----	------
BC	2	1019.30	509.65	2.467	----	------
ABC	2	31.07	15.54	------	----	------
D	1	166.39	166.39	------	----	------
AD	1	207.50	207.50	1.004	----	------
BD	2	162.39	81.20	------	----	------
CD	1	729.48	729.48	3.531	----	------
ABD	2	859.79	429.89	2.081	----	------
ACD	1	151.44	151.44	------	----	------
BCD	2	10.49	5.24	------	----	------
ABCD	2	298.78	144.89	------	----	------
Within Subgroups	7	1447.00	206.71	------	----	------

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

TABLE LXXX

Analysis of Variance Table[1]
Teaching Experiment: External or Comparative Judgments: Spontaneity

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	8.32	8.32	------	----	-----
B	2	1511.59	755.80	1.935	----	-----
C	1	1068.78	1068.78	2.736	----	-----
AB	2	431.96	215.98	------	----	-----
AC	1	647.77	647.77	1.658	----	-----
BC	2	143.75	71.88	------	----	-----
ABC	2	312.60	156.30	------	----	-----
D	1	456.99	456.99	1.170	----	-----
AD	1	80.01	80.01	------	----	-----
BD	2	638.16	319.08	------	----	-----
CD	1	14.00	14.00	------	----	-----
ABD	2	230.99	115.50	------	----	-----
ACD	1	401.58	401.58	1.028	----	-----
BCD	2	262.64	131.32	------	----	-----
ABCD	2	322.71	161.36	------	----	-----
Within Subgroups	7	2734.00	390.57	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

TABLE LXXXI

Analysis of Variance Table[1]
Teaching Experiment: External or Comparative Judgments: Divergency
N=31

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	522.19	522.19	1.577	----	-----
B	2	544.32	272.16	------	----	-----
C	1	144.10	144.10	------	----	-----
AB	2	932.89	466.45	------	----	-----
AC	1	143.86	143.86	------	----	-----
BC	2	204.26	102.13	------	----	-----
ABC	2	667.42	333.71	------	----	-----
D	1	1993.18	1993.18	6.019	.05	D-1 > D-2
AD	1	133.30	133.30	------	----	-----
BD	2	665.15	332.58	1.004	----	-----
CD	1	744.73	744.73	2.249	----	-----
ABD	2	208.09	104.05	------	----	-----
ACD	1	1075.45	1075.45	3.248	----	-----
BCD	2	41.82	20.91	------	----	-----
ABCD	2	301.48	150.74	------	----	-----
Within Subgroups	7	2321.00	331.57	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table Vi for a description of Factors, p. 52.

TABLE LXXXII

Analysis of Variance Table[1]
Teaching Experiment: External or Comparative Judgments: Greatest Strategy Gain
N=31

Source of Variation[2]	Degrees of Freedom	Sums of Squares	Mean Squares	F-Ratio	Probability	Direction
A	1	638.90	638.90	7.603	.05	A-1>A-2
B	2	374.22	187.11	2.227	----	-----
C	1	85.66	85.66	1.019	----	-----
AB	2	195.06	97.53	1.161	----	-----
AC	1	6.31	6.31	------	----	-----
BC	2	466.42	233.21	2.775	----	-----
ABC	2	96.33	48.16	------	----	-----
D	1	22.54	22.54	------	----	-----
AD	1	13.53	13.53	------	----	-----
BD	2	477.52	223.76	2.663	----	-----
CD	1	51.18	51.18	------	----	-----
ABD	2	75.18	37.59	------	----	-----
ACD	1	1231.43	1231.43	14.654	.01	-----
BCD	2	263.61	131.81	1.569	----	-----
ABCD	2	138,38	69,19	------	----	-----
Within Subgroups	7	588.50	84.07	------	----	-----

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[1] For method of computation, see footnote on Table LXI, p. 199.

[2] See Table VI for a description of Factors, p. 52.

TABLE LXXXIII

Mean Gains of Treatment Groups in the Teaching Experiment, by Experimental Periods: Aesthetic Quality
N=31

	Period 3	Period 4	Period 5
Factor A-1 (N=15)	.89	3.54	1.63
A-2 (N=16)	.41	- .75	-2.94
B-1 (N=8)	3.73	2.49	2.06
B-2 (N=8)	- .88	5.89	1.44
B-3 (N=15)	- .19	-1.73	-3.37
C-1 (N=16)	.54	1.07	.62
C-2 (N=15)	.75	1.60	-2.17
D-1 (N=16)	1.50	2.05	- .07
D-2 (N=15)	- .27	.55	-1.43

Mean Gains of Treatment Groups in the Teaching Experiment, by Experimental Periods: Spontaneity
N=31

	Period 3	Period 4	Period 5
Factor A-1 (N=15)	2.51	.23	- .05
A-2 (N=16)	- .47	2.35	1.85
B-1 (N=8)	.46	- .32	-1.36
B-2 (N=8)	4.68	6.21	4.18
B-3 (N=15)	- .73	- .40	.42
C-1 (N=16)	-1.71	- .64	- .10
C-2 (N=15)	3.84	3.42	2.03
D-1 (N=16)	.89	.09	-1.48
D-2 (N=15)	1.06	2.64	3.50

TABLE LXXXIV

Mean Gains of Treatment Groups in the Teaching Experiment, by Experimental Periods: Divergency
N=31

	Period 3	Period 4	Period 5
Factor A-1 (N=15)	.40	1.44	.57
A-2 (N=16)	-1.51	-2.15	-2.01
B-1 (N=8)	1.19	-1.46	3.47
B-2 (N=8)	-4.25	-1.30	-2.87
B-3 (N=15)	.42	.62	-1.89
C-1 (N=16)	.24	- .57	.72
C-2 (N=15)	-1.48	- .24	-2.34
D-1 (N=16)	.64	2.34	2.96
D-2 (N=15)	-1.89	-3.35	-4.73